UNDERSTANDING THE VARIABILITY IN VALUE SETS: THE ROLE OF STEWARD

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A thesis submitted to Johns Hopkins University in conformity with the requirements for

the degree of Master of Science

Baltimore, Maryland
August 2019

ABSTRACT

The goal of this research was to find out whether a statistical signal of a steward's purpose could be ascertained through viewing the length of the value sets or the lengths of the intersections of pairs of value sets, with the same domain intension.

We gathered 239 value sets from 22 stewards on the National Library of Medicine's Value Set Authority Center (VSAC) and 8 domain categories (e.g. Cardiovascular Disease, Infectious Diseases, Mental Health, etc.). We used an interview with an expert to find out the purpose/role of stewards. And we conducted a second interview to decide which purpose/role fit each steward. Using the results, we conducted statistical analysis (Univariate, ANOVA, Linear Regression) to determine variability of the data and the correlation between the purpose of each steward and the value set size.

The results suggested that there is no statistical significance in variability of the value set size by purpose. However, the results of the regression analysis indicated that the purpose of an organization is statistically significant and has a positive correlation with the value set size.

Unlike the conventional methods for checking the sensitivity and specificity of a value set, such as face validity, our method is a quick way of classifying value. However, we were limited in our data size stemming solely from VSAC. An expanded data set encompassing value sets from other vendors could yield different results.

The results of this research, from the data we gathered, supports our hypothesis that the purpose of an organization has a correlation with the value set size. However, further study still needs to be done as the availability of data for our research was limited to VSAC.

Key words: Value Set, Purpose of an Organization, Steward, VSAC

Primary Reader and Advisor: Harold P. Lehmann

Secondary Reader: Alain B. Labrique

ACKNOWLEDGEMENTS

I would like to express my deepest thanks to all involved. First, **Dr. Harold Lehmann** for his invaluable support, generous time spent to mentor me, and the constructive feedback every step of the way. And to **Dr. Suzan Lowry** for the initial discussions for my Thesis. Also, I would like to acknowledge **Dr. Jonathan Weiner**, with whom I was able to gain expert feedback to complete this thesis. **Dr. Hadi Kharrazi** and **Dr. Zahid Butt** were also instrumental in my initial discussion concerning value sets. I am grateful for **Otniel Y. Viktorisa**, who provided expert advice in coding. Also, to **Dr. Jonathan Haposan** and **Lili Nur Indah Sari** for their initial discussion on Statistics.

Apart from those who directly contributed to this Thesis, I would like to acknowledge **Dr. Alain Labrique**, my faculty advisor, who always encouraged me to go above and beyond. Also, to **Dr. Ashwini Davison** who has been a close mentor. And to **Dr. Christopher Chute** without whom, I would not have considered Johns Hopkins for my Masters. Others who have been invaluable during my time at Hopkins include **Kersti Winny** who has always been ready to help with my academic needs from day 1 and **Stacey Szczypinski** who provided help along the way. Lastly, I would like to thank the **International Institute of Education** and the **Indonesian International Education Foundation** for helping me during my studies here in the United States and training in Indonesia.

I would like to thank my family for all their love, prayer, and support. And my fiancé who has always been my biggest supporter as well as his father and family. Also, to all my friends and

classmates who have given their support and prayers throughout my time here. And Lastly, **Mr. Sis Wuryanto** who has been my mentor, teacher, and friend for many years.

DEDICATION

This Thesis is dedicated to **USAID PRESTASI** who gave me the chance of a lifetime to further my education in the United States at Johns Hopkins.

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I. INTRODUCTION

Besides being used for documenting clinical history of patients[1], Electronic Health Records (EHRs) are being used to generate quality care indicators[2]. Each measure has each numerator and denominator, defined in terms of value sets for diagnoses and/or procedures (e.g., which International Classification of Diseases and related Health 10th Revision (ICD-10-CM) codes are called stroke). Stroke is the *intention* of the numerator and denominator and in the use of the actual codes, comprise value sets. A value set is a collection of codes from one or more standardized vocabularies[1,3] (e.g., ICD or Current Procedural Terminology or CPT) that can identify a specific population or cohort with some conditions, diagnoses, or procedures with a particular purpose. A value set is an *extension* set of codes to reflect an intention.[3]

For quality reporting programs, the Center for Medicare and Medicare Services (CMS) uses Electronic Clinical Quality Measures (eCQMs) to measure and track the quality of healthcare services[4]. The National Library of Medicine (NLM) created a platform, The Value Set Authority Center (VSAC), to support the authoring, maintenance, and dissemination of value sets used for variance purposes including quality measurement[5]. As VSAC has an essential role in eCQMs[6], high-quality value sets must be acquired. VSAC has specific regulations for the quality of the value sets. The major principles that define the high quality of value sets are clinical validity, metadata completeness, non-redundancy, all value set codes are valid in the code system, descriptors match code system descriptors, code list completeness, logical correctness, proper terminological hierarchies, concept property similarity, and code system alignment to standards[7]. The non-

redundancy principle has clearly not yet been achieved as there are still many redundancies of value sets with the same intension[8].

A cursory review of the value sets shows that, even though they share the same intention, value set sizes ostensibly for the same disease are different. Differences in value set sizes affects the number of patients that are identified by the value sets, and therefore, by the corresponding quality measures. It means that different value sets will have different false negatives (FN) and false positives (FP). Thus, understanding the relationship between the intention and extension behind a value set is important.

Given that the same disease or quality measure has different value sets suggests that the choices of value sets reflect some purpose of the measure. Since measures (and their value sets) are assembled and adopted by different organizations acting as *Stewards* for these measures, we would surmise that the goals of the Steward would affect the false-negative/false-positive tradeoff they accept in assembling and adopting a particular value set for, and therefore definition of, a measure. In lieu of examining the details of each value-set choice, we have settled on the size of the value set as a proxy for the contents of the measure.

Our working hypothesis is that the Steward's role and purpose impact the size of their value sets. To test this hypothesis, we compared the sizes of different value sets with their Stewards. To complete the analysis, we characterized the intentions of the value sets, for which characterization we need experts to make the characterization. Thus, the study is a combination of expert review and statistical analysis of meta-data (i.e., non-patient data).

The purpose of this research is to answer to what degree do the variables behind a value set (e.g. for a quality-improvement measure) from one Steward to another Steward within the same Domain intension correlate with the extension (contents) of the value set?

II. METHODS

The statistical model below (*See Figure 2.1.*) shows our working hypothesis for how the variables that we are proposing influence the value set size. The variables are *organization* (Steward), *purpose* of an organization, Domain *Category* and *Domain*, *Vocabulary*, and *Value Set Size* (extension size). We propose that an organization that creates a value set is influenced by their organizational purposes, and therefore the false positive or false negative errors that results are, in the long run, due to that purpose. The value set size is, in turn, affected by the variables mentioned above.

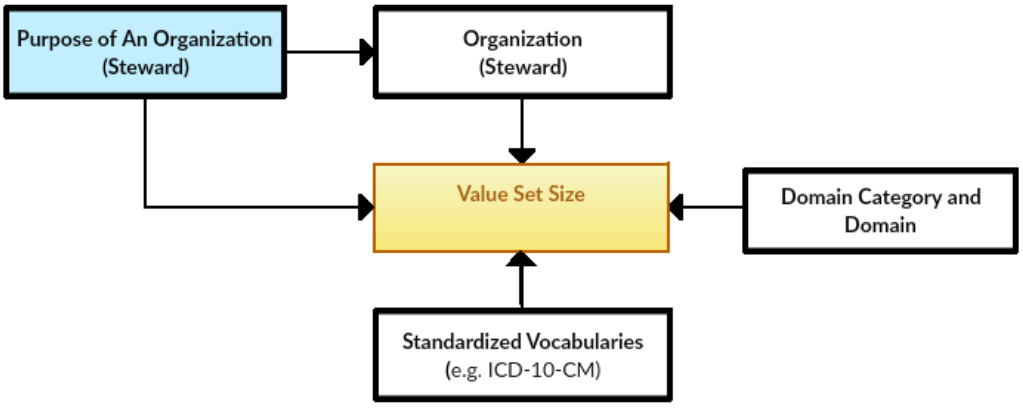

Figure 2.1. Diagram of Statistical Model of Value Set Study

1. Purpose

The variables in the model are available, except for the purpose of the organization. We conducted interviews with an expert. As shown on the project flowchart below (*See Figure 2.2.*), there are two parts to this interview process. In the first part, we asked the expert to define the purpose of each organization (Steward). We used information from each organization's official website to ascertain its purpose. After we received the list of candidates of purposes,

we conducted part two, which was to ask the expert to review each statement of purpose. The expert determined the Vocabulary to define each organization's purpose.

The Interview with Expert Part A was conducted via emails, including asking the clarity of the Vocabulary of purpose that the expert provided. Part B was conducted via a Survey tool, Qualtrics. The survey contained the name of the Stewards, their website address, their Vision/Mission/Goal Written Statements from their website, and the value sets list that the Steward involved in on VSAC (*See Appendix 1. The Value Set Study (Interview Part B) Protocol*).

Figure 2.2. Diagram of the Process of Collecting Purpose of Organization (Steward) Data

2. Value Sets

Our data set consisted of value sets extracted from VSAC as well as the Vocabulary determined by the experts. Our inclusions for our data set that we extracted from VSAC were:

- Extensional Value Sets (as opposed to intentional or, rule-based)
- Diagnosis (this limit because of its easiness to compare with other value sets that might be available from public research in the further research in the same field)
- Vocabulary / Code system only in ICD-9-CM, ICD-10-CM, or SNOMED-CT (this limit is due to the limitation to diagnosis)
- Domain included at least 2 value sets (meeting the above criteria)
- Domains that can be categorized into cancer, diabetes, cardiovascular disease, respiratory disease, mental health, infectious disease, urinary system disorder, and liver disease

  The choice of Domains was based on its availability on VSAC according to the above criteria and one Domain has more than one value set with different Steward.

We created a database using PostgreSQL that consisted of the extracted data from VSAC. This database was populated via a custom java.jar file and we used SQL to organize the extracted data into the tables needed in PostgreSQL. We added the Purpose from the expert interview process into the main data set.

3. Intersections

Because our core hypothesis involves comparing value sets for the same Domain but by different Stewards, we examined the Venn diagram of each pair of Stewards, focusing on the intersection of the value set codes, and the size of that intersection as a separate dependent variable.

Thus for every pair of value sets (within a Domain and with the same Vocabulary), we constructed a dataset that included the intersection of the codes (i.e., the count of the number of codes they had in common), as well as the Domain Category, Domain, Vocabulary , then the Steward, Purpose, and Value Set Size for each member of the pair, and then the size of the intersection.

4. Statistical Analysis

We conducted univariate analyses for data-quality review of Domain Category, Domain, Steward, Vocabulary (code system), the purpose of organization and value set size. For distributions of the dependent variables, value set and intersection size, that were skewed, we transformed the data. Afterwards we conducted the analysis using an Analysis of Variance Between Two or More Groups (ANOVA) and Simple Linear Regression.

III. RESULTS

Based on the Inclusions criteria above we collected 239 value sets and 22 Stewards among 61 Stewards total in VSAC per August 2019 (*See Appendix 2. Data Dictionary*).

1. Data Set

Based on the data set extracted from VSAC with certain inclusions and the interview with the experts, we produced data sets for our data analysis as seen in Table of Value Set Study and Intersection Size Datasets in *Appendix 3* and *4*. *Appendix 2* provides us with the reference for both data sets.

Below are the Summaries of Statistics of the Means of Value Set Size across Domain Category, Domain, Steward, and Vocabulary (*See Table 3.1.-3.4.*). These summary statistics will provide us a general information about the data sets we used.

Table 3.1. Summary Statistics of Means and Standard Deviations of Value Set Size and Log 10 Value Set Size by Domain Category

Domain Category	Vocabulary	Number of Value Sets	Value Set Size Mean	Value Set Size Standard Deviation	Log 10 Value Set Size Mean	Log 10 Value Set Size Standard Deviation
Cancer	ICD-9-CM	10	236	368	1.4	1.1
Cancer	ICD-10-CM	13	536.4	689.7	1.9	1.2
Cancer	SNOMED-CT	8	989.8	1733.6	2.1	0.9
Diabetes	ICD-9-CM	5	26.2	15.6	1.4	0.2
Diabetes	ICD-10-CM	6	134.2	127.8	1.8	0.6
Diabetes	SNOMED-CT	5	35.2	40.1	1.3	0.6
Cardiovascular Disease	ICD-9-CM	14	19.9	16.7	1	0.6
Cardiovascular Disease	ICD-10-CM	21	48.1	108.6	1.1	0.6
Cardiovascular Disease	SNOMED-CT	18	55.4	81.5	1.4	0.7
Respiratory Disease	ICD-9-CM	8	12	9.4	1	0.4
Respiratory Disease	ICD-10-CM	12	14.4	8.3	1	0.4
Respiratory Disease	SNOMED-CT	10	38.2	41.4	1.4	0.5
Mental Health	ICD-9-CM	12	125.5	191.7	1.6	0.7
Mental Health	ICD-10-CM	13	167.8	291.6	1.7	0.7
Mental Health	SNOMED-CT	13	340.1	490.1	2.2	0.6
Infectious Disease	ICD-9-CM	11	80.5	221	1	0.8
Infectious Disease	ICD-10-CM	16	82.4	232.8	1.2	0.7
Infectious Disease	SNOMED-CT	16	242.8	762.3	1.7	0.6
Urinary System Disorder	ICD-9-CM	5	17	20.5	1	0.4
Urinary System Disorder	ICD-10-CM	6	20.8	30.6	1	0.6
Urinary System Disorder	SNOMED-CT	2	26.5	36.1	0.9	1.2
Liver Disease	ICD-9-CM	4	5.3	4.3	0.6	0.5
Liver Disease	ICD-10-CM	6	4.2	3.4	0.5	0.4
Liver Disease	SNOMED-CT	5	16.4	8.8	1.2	0.2

Table 3.2. Summary Statistics of Means and Standard Deviations of Value Set Size and Log 10 Value Set Size by Domain

Domain	Vocabulary	Number of Value Sets	Value Set Size Mean	Value Set Size Standard Deviation	Log 10 Value Set Size Mean	Log 10 Value Set Size Standard Deviation
Cancer	ICD-9-CM	3	768	52.89	2.88	0.03
Cancer	ICD-10-CM	5	1358.4	232.42	3.13	0.07
Cancer	SNOMED-CT	2	3798	73.54	3.58	0.01
Breast Cancer	ICD-9-CM	2	9.5	0.71	0.98	0.03
Breast Cancer	ICD-10-CM	3	36.33	15.31	1.54	0.17
Breast Cancer	SNOMED-CT	2	58.5	14.85	1.76	0.11
Colorectal Cancer	ICD-9-CM	2	12.5	0.71	1.1	0.02
Colorectal Cancer	ICD-10-CM	2	13.5	2.12	1.13	0.07
Colorectal Cancer	SNOMED-CT	1	53	0	1.72	0
Malignant Melanoma of Skin	ICD-9-CM	1	10	0	1	0
Malignant Melanoma of Skin	ICD-10-CM	1	43	0	1.63	0
Malignant Melanoma of Skin	SNOMED-CT	2	70	19.8	1.84	0.12
Prostate Cancer	ICD-9-CM	2	1	0	0	0
Prostate Cancer	ICD-10-CM	2	1	0	0	0
Prostate Cancer	SNOMED-CT	1	12	0	1.08	0
Diabetes	ICD-9-CM	1	54	0	1.73	0
Diabetes	ICD-10-CM	2	291	18.38	2.46	0.03
Diabetes	SNOMED-CT	1	101	0	2	0
Gestational Diabetes	ICD-10-CM	2	12.5	4.95	1.08	0.18
Gestational Diabetes	SNOMED-CT	2	4.5	2.12	0.63	0.21
Type 1 Diabetes	ICD-9-CM	2	19.5	0.71	1.29	0.02
Type 1 Diabetes	ICD-10-CM	1	98	0	1.99	0
Type 1 Diabetes	SNOMED-CT	1	43	0	1.63	0

Type 2 Diabetes	ICD-9-CM	2	19	1.41	1.28	0.03
Type 2 Diabetes	ICD-10-CM	1	100	0	2	0
Type 2 Diabetes	SNOMED-CT	1	23	0	1.36	0
Acute Myocardial Infarction	ICD-9-CM	4	22.75	5.5	1.35	0.1
Acute Myocardial Infarction	ICD-10-CM	5	10.6	2.3	1.02	0.09
Acute Myocardial Infarction	SNOMED-CT	4	37.5	26.16	1.34	0.7
Acute Pulmonary Edema	ICD-9-CM	1	2	0	0.3	0
Acute Pulmonary Edema	ICD-10-CM	2	1.5	0.71	0.15	0.21
Acute Pulmonary Edema	SNOMED-CT	2	7.5	9.19	0.57	0.81
Aortic Dissection	ICD-9-CM	1	4	0	0.6	0
Aortic Dissection	ICD-10-CM	2	5.5	2.12	0.72	0.17
Aortic Dissection	SNOMED-CT	2	23.5	24.75	1.2	0.59
Atrial Fibrillation	ICD-9-CM	2	1.5	0.71	0.15	0.21
Atrial Fibrillation	ICD-10-CM	2	5.5	2.12	0.72	0.17
Atrial Fibrillation	SNOMED-CT	3	11	8.54	0.89	0.52
Cardiopulmonary Arrest	ICD-9-CM	1	3	0	0.48	0
Cardiopulmonary Arrest	ICD-10-CM	2	9.5	0.71	0.98	0.03
Cardiopulmonary Arrest	SNOMED-CT	2	38	18.38	1.55	0.22
Heart Failure	ICD-9-CM	2	24	0	1.38	0
Heart Failure	ICD-10-CM	2	24	2.83	1.38	0.05
Heart Failure	SNOMED-CT	1	71	0	1.85	0
Hypertension	ICD-9-CM	1	33	0	1.52	0
Hypertension	ICD-10-CM	2	25.5	16.26	1.36	0.3
Hypertension	SNOMED-CT	2	121	101.82	1.99	0.42
Ischemic Vascular Disease	ICD-9-CM	1	59	0	1.77	0
Ischemic Vascular Disease	ICD-10-CM	2	372.5	30.41	2.57	0.04
Ischemic Vascular Disease	SNOMED-CT	1	330	0	2.52	0

Obstetric VTE	ICD-9-CM	1	35	0	1.54	0
Obstetric VTE	ICD-10-CM	2	34.5	2.12	1.54	0.03
Obstetric VTE	SNOMED-CT	1	33	0	1.52	0
Asthma	ICD-9-CM	3	11.33	2.52	1.05	0.1
Asthma	ICD-10-CM	4	18.5	1	1.27	0.02
Asthma	SNOMED-CT	1	50	0	1.7	0
Chronic Obstructive Pulmonary Disease	ICD-9-CM	2	3.5	0.71	0.54	0.09
Chronic Obstructive Pulmonary Disease	ICD-10-CM	3	6	5.2	0.68	0.35
Chronic Obstructive Pulmonary Disease	SNOMED-CT	3	23	28.62	1.12	0.56
Dyspnea	ICD-9-CM	1	4	0	0.6	0
Dyspnea	ICD-10-CM	2	5.5	3.54	0.69	0.3
Dyspnea	SNOMED-CT	3	14.67	7.02	1.13	0.22
Pneumonia	ICD-9-CM	2	25.5	4.95	1.4	0.08
Pneumonia	ICD-10-CM	3	23.33	1.53	1.37	0.03
Pneumonia	SNOMED-CT	3	73	61.61	1.72	0.46
Mental Health Diagnosis	ICD-9-CM	3	439.67	64.66	2.64	0.07
Mental Health Diagnosis	ICD-10-CM	3	631.67	298.59	2.76	0.26
Mental Health Diagnosis	SNOMED-CT	3	1191.67	141.81	3.07	0.05
Anxiety	ICD-9-CM	1	14	0	1.15	0
Anxiety	ICD-10-CM	2	56	5.66	1.75	0.04
Anxiety	SNOMED-CT	2	125	48.08	2.08	0.17
Bipolar Disorder	ICD-9-CM	3	34.67	9.24	1.53	0.13
Bipolar Disorder	ICD-10-CM	3	33.67	5.77	1.52	0.08
Bipolar Disorder	SNOMED-CT	3	101	5	2	0.02
Dementia	ICD-9-CM	1	25	0	1.4	0
Dementia	ICD-10-CM	2	20.5	6.36	1.3	0.14
Dementia	SNOMED-CT	2	73.5	58.69	1.78	0.39

Major Depression	ICD-9-CM	4	11	1.15	1.04	0.05
Major Depression	ICD-10-CM	3	11	1	1.04	0.04
Major Depression	SNOMED-CT	3	48.67	11.15	1.68	0.11
Infection	ICD-9-CM	2	374	523.26	1.74	1.6
Infection	ICD-10-CM	2	486	656.2	2.16	1.16
Infection	SNOMED-CT	2	1560.5	2167.28	2.47	1.44
Measles	ICD-9-CM	1	7	0	0.85	0
Measles	ICD-10-CM	2	9	1.41	0.95	0.07
Measles	SNOMED-CT	2	17	2.83	1.23	0.07
Mumps	ICD-9-CM	1	9	0	0.95	0
Mumps	ICD-10-CM	2	12	1.41	1.08	0.05
Mumps	SNOMED-CT	2	22.5	2.12	1.35	0.04
Otitis Media	ICD-9-CM	1	8	0	0.90	0
Otitis Media	ICD-10-CM	2	41.5	2.12	1.62	0.02
Otitis Media	SNOMED-CT	2	66	43.84	1.77	0.31
Rubella	ICD-9-CM	1	7	0	0.85	0
Rubella	ICD-10-CM	2	10	2.83	0.99	0.12
Rubella	SNOMED-CT	2	25.5	6.36	1.40	0.11
Septic Shock	ICD-9-CM	2	2	1.41	0.24	0.34
Septic Shock	ICD-10-CM	2	2.5	2.12	0.3	0.43
Septic Shock	SNOMED-CT	2	20.5	10.61	1.28	0.24
Severe Sepsis	ICD-9-CM	2	17	22.63	0.76	1.07
Severe Sepsis	ICD-10-CM	2	19	25.46	0.78	1.11
Severe Sepsis	SNOMED-CT	2	37.5	26.16	1.51	0.33
Syphilis	ICD-9-CM	1	68	0	1.83	0
Syphilis	ICD-10-CM	2	79	24.04	1.89	0.13
Syphilis	SNOMED-CT	2	193	11.31	2.29	0.03
Hematuria	ICD-9-CM	1	4	0	0.6	0

Hematuria	ICD-10-CM	2	4	2.12	0.5	0.28
Hematuria	SNOMED-CT	1	1	0	0	0
Infections of the Kidney	ICD-9-CM	2	7	2.83	0.8	0.18
Infections of the Kidney	ICD-10-CM	2	9	6.36	0.9	0.36
Infections of the Kidney	SNOMED-CT	1	52	0	1.716	0
Renal Insufficiency	ICD-9-CM	2	34	27.58	1.4	0.41
Renal Insufficiency	ICD-10-CM	2	51	44.55	1.6	0.45
Hepatitis A	ICD-9-CM	1	2	0	0.3	0
Hepatitis A	ICD-10-CM	2	3	0.71	0.4	0.12
Hepatitis A	SNOMED-CT	2	12	3.54	1.1	0.14
Hepatitis B	ICD-9-CM	2	9	0	1	0
Hepatitis B	ICD-10-CM	2	9	0.71	0.9	0.04
Hepatitis B	SNOMED-CT	2	26	3.54	1.4	0.06
Jaundice	ICD-9-CM	1	1	0	0	0
Jaundice	ICD-10-CM	2	2	0.71	0.2	0.21
Jaundice	SNOMED-CT	1	8		0.9	0

Table 3.3. Summary Statistics of Means and Standard Deviations of Value Set Size and Log 10 Value Set Size by Steward

Steward	Vocabulary	Number of Value Sets	Value Set Size Mean	Value Set Size Standard Deviation	Log 10 Value Set Size Mean	Log 10 Value Set Size Standard Deviation
American Academy of Allergy Asthma and Immunology	ICD-10-CM	1	20	0	1.3	0
American Academy of Neurology	ICD-9-CM	1	25	0	1.4	0
American Academy of Neurology	ICD-10-CM	1	25	0	1.4	0
American Academy of Neurology	SNOMED-CT	1	32	0	1.51	0
American College of Emergency Physicians/AMA-PCPI	ICD-9-CM	5	150.4	331.83	0.75	1.21

American College of Emergency Physicians/AMA-PCPI	ICD-10-CM	5	192.2	423.63	0.9	1.19
American College of Emergency Physicians/AMA-PCPI	SNOMED-CT	7	461.14	1160.66	1.57	0.9
American Medical Association-convened Physician Consortium for Performance Improvement®	ICD-9-CM	1	10	0	1	0
American Medical Association-convened Physician Consortium for Performance Improvement®	ICD-10-CM	1	10	0	1	0
American Medical Association-convened Physician Consortium for Performance Improvement®	SNOMED-CT	1	36	0	1.56	0
American Society of Clinical Oncology	ICD-9-CM	5	148.8	312.08	1.21	1.03
American Society of Clinical Oncology	ICD-10-CM	6	390.33	581.66	1.65	1.2
Change Healthcare	ICD-9-CM	3	12.33	10.41	0.98	0.39
Change Healthcare	ICD-10-CM	5	143.6	180.48	1.69	0.78
Change Healthcare	SNOMED-CT	2	5	4.24	0.6	0.43
College of American Pathologists Steward	SNOMED-CT	2	62.5	9.19	1.79	0.06
Council of State and Territorial Epidemiologists Steward	ICD-10-CM	11	19.09	28.5	0.89	0.63
Council of State and Territorial Epidemiologists Steward	SNOMED-CT	11	42.18	60.21	1.2	0.73
Lantana	ICD-9-CM	10	58.6	147.42	1.02	0.77
Lantana	ICD-10-CM	10	96.9	264.14	1.13	0.79
Lantana	SNOMED-CT	8	154.5	353.54	1.56	0.69
Lewin EH Steward	ICD-9-CM	5	172.8	172.8	1.19	1.19
Lewin EH Steward	ICD-10-CM	10	336.5	336.5	1.42	1.42
Lewin EH Steward	SNOMED-CT	5	829.2	829.2	2.25	2.25
Mathematica	ICD-9-CM	1	14	0	1.15	0
Mathematica	ICD-10-CM	1	60	0	1.78	0
Mathematica	SNOMED-CT	1	159	0	2.2	0
MITRE	ICD-10-CM	2	34	25.46	1.46	0.36

MITRE	SNOMED-CT	2	48.5	60.1	1.37	0.84
MN Community Measurement	ICD-9-CM	2	26	19.8	1.34	0.37
MN Community Measurement	ICD-10-CM	1	37	0	1.57	0
MN Community Measurement	SNOMED-CT	1	106	0	2.03	0
National Committee for Quality Assurance	ICD-9-CM	21	38.52	77.2	1.24	0.5
National Committee for Quality Assurance	ICD-10-CM	22	66.59	105.3	1.39	0.62
National Committee for Quality Assurance	SNOMED-CT	22	121.64	266.64	1.68	0.56
New Jersey Innovation Institute	ICD-9-CM	1	9	0	0.95	0
New Jersey Innovation Institute	ICD-10-CM	2	25.5	10.61	1.39	0.19
Oncology Nursing Society	ICD-10-CM	1	54	0	1.73	0
Oncology Nursing Society	SNOMED-CT	1	22	0	1.34	0
Optum	ICD-9-CM	1	9	0	0.95	0
Optum	ICD-10-CM	1	8	0	0.9	0
Optum	SNOMED-CT	1	23	0	1.36	0
PCPI Foundation	ICD-9-CM	6	142.33	320.32	1.23	0.94
PCPI Foundation	ICD-10-CM	6	231	527.21	1.36	1.01
PCPI Foundation	SNOMED-CT	6	680.67	1552.77	1.94	0.85
Quality Insights of Pennsylvania	ICD-9-CM	1	24	0	1.38	0
Quality Insights of Pennsylvania	ICD-10-CM	1	27	0	1.43	0
Quality Insights of Pennsylvania	SNOMED-CT	1	101	0	2	0
The Joint Commission	ICD-9-CM	4	131.25	230.92	1.39	1
The Joint Commission	ICD-10-CM	4	204.25	368.03	1.63	0.88
The Joint Commission	SNOMED-CT	4	333	630.13	1.55	1.16
Vanderbilt University Electronic Medical Record and Genomics Network	ICD-9-CM	2	18.5	0.71	1.27	0.02
Yale	ICD-9-CM	1	20	0	1.3	0
Yale	ICD-10-CM	1	9	0	0.95	0
Yale	SNOMED-CT	1	37	0	1.57	0

Table 3.4. Summary Statistics of Means and Standard Deviations of Value Set Size and Log 10 Value Set Size by Purpose

Purpose	Vocabulary	Number of Value Sets	Value Set Size Mean	Value Set Size Standard Deviation	Log 10 Value Set Size Mean	Log 10 Value Set Size Standard Deviation
Creation (where nothing exists) to benefit participants	ICD-9-CM	5	150.4	331.83	0.75	1.21
Creation (where nothing exists) to benefit participants	ICD-10-CM	16	73.19	235.08	1.86	2.37
Creation (where nothing exists) to benefit participants	SNOMED-CT	20	190.85	684.66	1.39	0.77
Facilitation of consensus across participants	ICD-9-CM	39	59	152.25	1.19	0.64
Facilitation of consensus across participants	ICD-10-CM	39	98.9	250.37	1.32	0.71
Facilitation of consensus across participants	SNOMED-CT	37	218.97	665.77	1.7	0.63
Monitoring (e.g., self-interest on behalf of an industry or cause)	ICD-9-CM	9	66.22	154.42	1.21	0.68
Monitoring (e.g., self-interest on behalf of an industry or cause)	ICD-10-CM	13	122.23	226.08	1.48	0.7
Monitoring (e.g., self-interest on behalf of an industry or cause)	SNOMED-CT	9	166.89	417.76	1.37	0.87
Development/Technical advancement	ICD-9-CM	14	119.71	269.67	1.2	0.86
Development/Technical advancement	ICD-10-CM	25	239.76	513.11	1.48	0.88
Development/Technical advancement	SNOMED-CT	11	408.45	1108.54	1.87	0.71
Academic involvement to further science or career (e.g., for academics)	ICD-9-CM	2	18.5	0.71	1.27	0.02

2. Data Analysis: Univariate Analysis

a. Domain Category

Domain Category is a group of several Clinical Domains (diseases/disorders/condition). As mentioned earlier in the Methods Chapter, there are 8 categories for this study: cancer, diabetes, cardiovascular disease, respiratory disease, mental health, infectious disease, urinary system disorder, and liver disease. The histogram below (*See Figure 3.1.*) shows us that the distribution is not skewed. The standard deviation (14.5) is lower than the mean (29.9), indicating that distribution is spread fairly even.

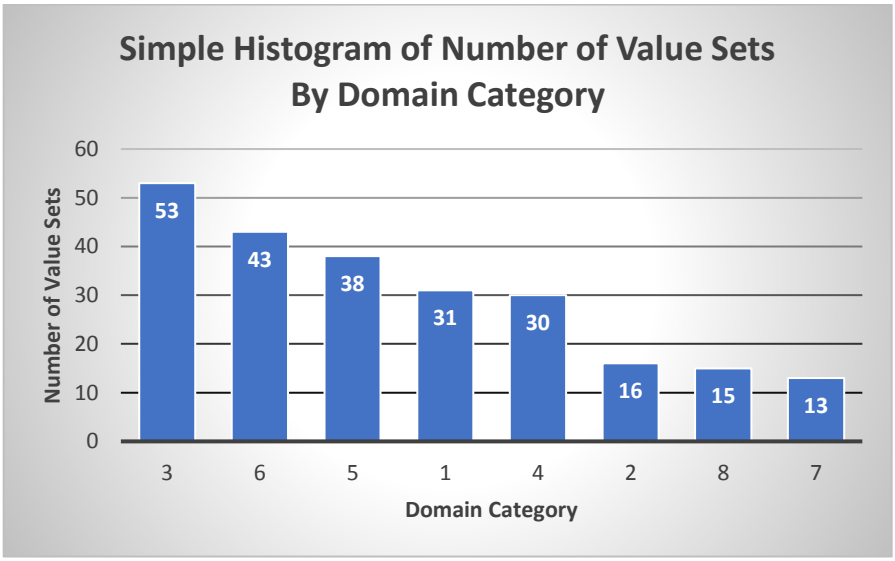

Figure 3.1. Simple Histogram of Number of Value Sets by Domain Category

b. Domain

Domain, in this context, is the Clinical Domain or any diagnoses/disorder/condition for which the value set was created. For example, if a provider wants to identify patients who have gestational diabetes, they can use a value set with a Domain specifically for gestational diabetes. This variable (Domain) is nominal. The mean number of value sets

by Domain is 5.8. The standard deviation of 2.0 is less than the mean, suggesting that the distribution is evenly spread. Domain is code by attaching the Domain Category Code Number as the first digit and then Domain digit itself to indicate as a specific diagnoses/disorder/condition.

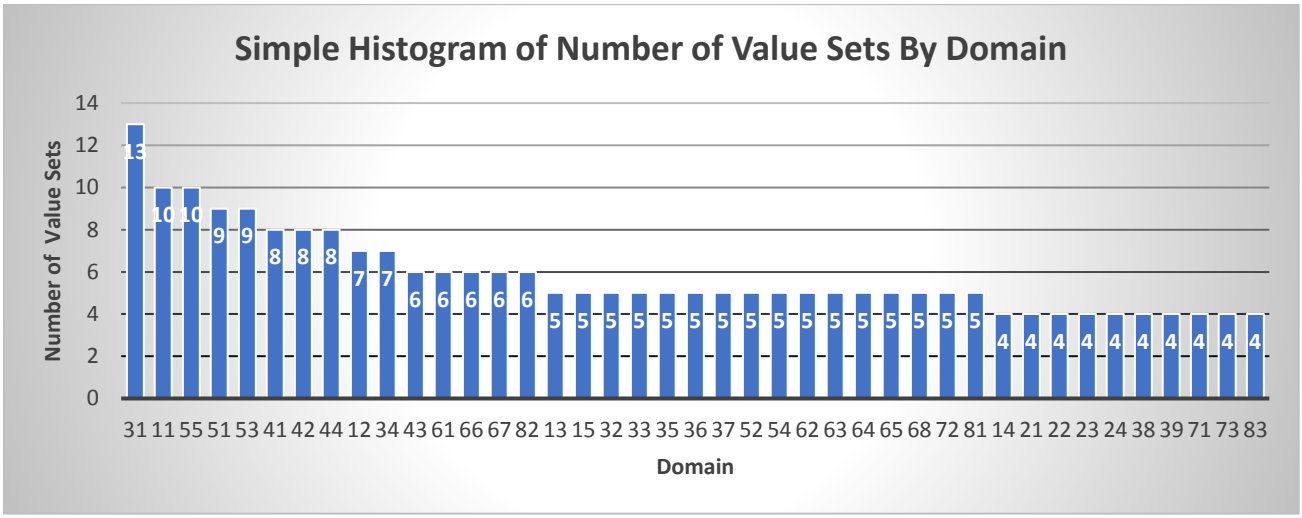

Figure 3.2. Simple Histogram of Number of Value Sets by Domain

c. Steward

The mean number of value sets by Steward is 10.9. The standard deviation, 14.4, is greater than the mean, suggesting that this distribution is not evenly distributed. The histogram suggests there are 3 classes of Stewards: one with the lion's share of value sets, then 8 with an intermediate number, and finally 14 with the smallest numbers.

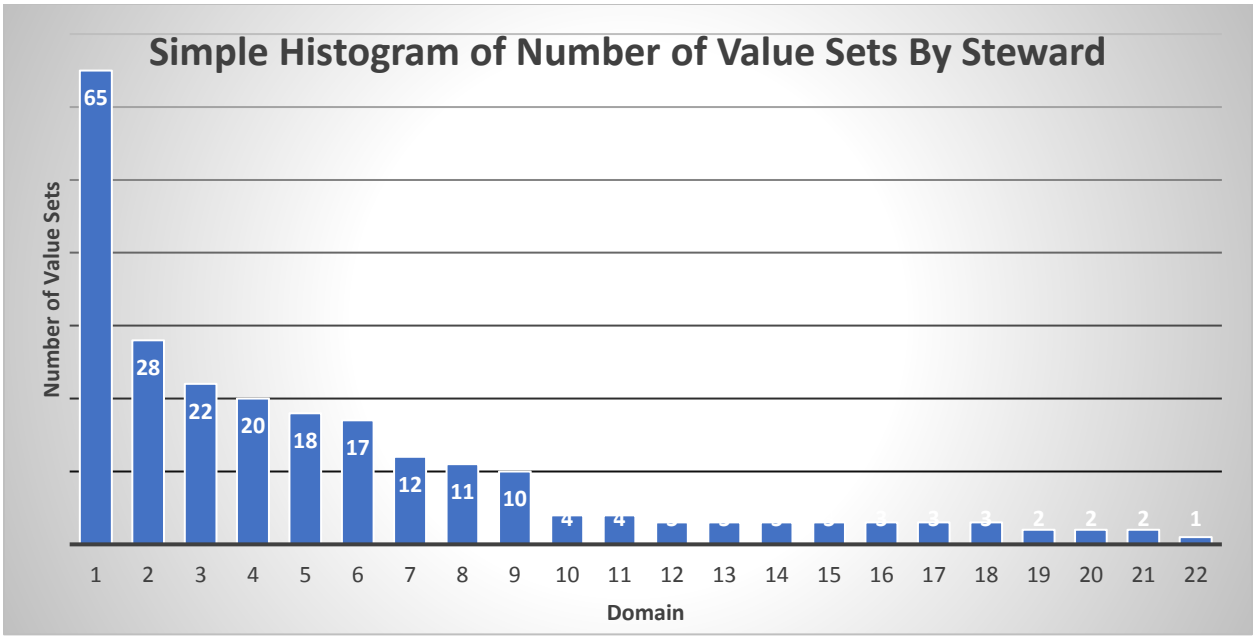

Figure 3.3. Simple Histogram of Number of Value Sets by Steward

d. Vocabulary

The Vocabulary is the standardized code system. As we mentioned in the inclusion criteria, there are only 3 vocabularies used in this study, ICD-9-CM, ICD-10-CM, and *Systematized Nomenclature of Medicine -- Clinical Term*s (SNOMED-CT). This inclusion is set because our study is limited to diagnosis/disorder/disease. The mean number of Value Sets by Vocabulary is 79.7., suggesting that in one code system or Vocabulary has around 80 value sets. The standard deviation is much smaller than the average, suggesting that the Vocabulary has good distribution and not too much variance.

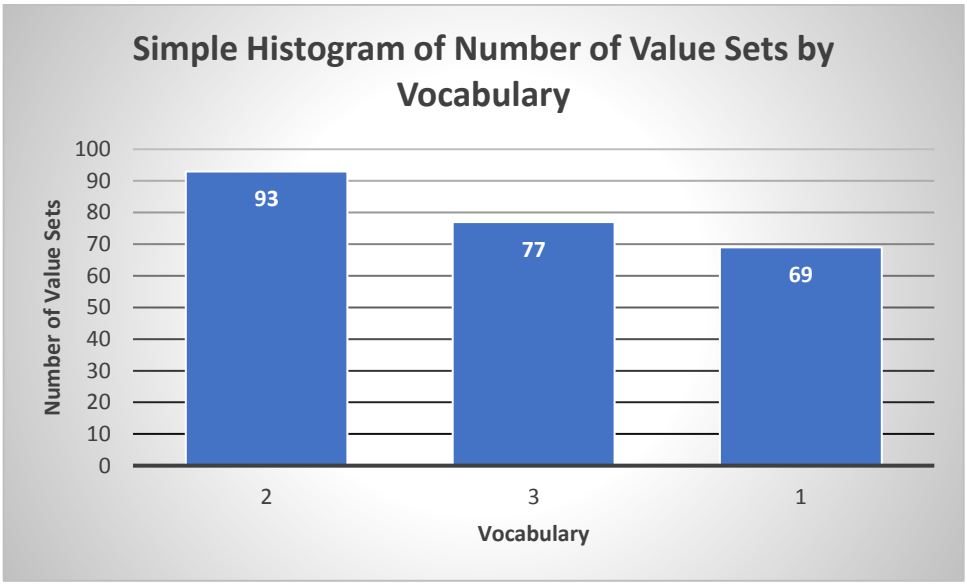

Figure 3.4. Simple Histogram of Number of Value Set by Vocabulary

e. Value Set Size

Based on the Summary Statistics of Value Set and Intersection Size below *(See Table 3.5),* we see that all standard deviations are bigger than the means. It makes the distribution skewed. Thus, we transformed the data using Log 10 so that we have better distributions for analysis. There are 8 pairs of value sets that have no intersections, which resulted in zero value. When we transformed the Intersection Size, those values automatically counted as missing values. Thus, in the Log 10 Intersection Size the observation became 151 from original of 159.

Table 3.5. Summary Statistics of Value Set, Log 10 Value Set, Intersection, and Log 10 Intersection Size

Variable	Observation	Mean	Standard Deviation
Value Set Size	239	150.15	472
Log 10 Value Set Size	239	1.36	0.76
Intersection Size	159	162.29	432.94
Log 10 Intersection Size	151	1.32	0.85

f. Purpose

Table 3.6. shows the number of Stewards in each Purpose. There are two Purposes that have zero values. We cannot not use these zero values for our data analysis. Thus, we do not use them in our data analysis. The 22 Stewards were spread fairly evenly to the four Purposes range from Purpose number 2 to 5 and only one Steward that falls into Purpose number 7. These Purposes are not categorical, thus there is no ordinal order within the purpose.

The Histogram below (*See Figure 3.5*) shows the numbers of value sets in each Purpose. The average number of value sets by the Purpose is 47.8, suggesting that in one Purpose has around 50 Value Sets.

Table 3.6. The number of Stewards in Each Purpose of Organization

Purpose	Number of Stewards
Verification of accuracy	0
Creation (where nothing exists) to benefit participants	3
Facilitation of consensus across participants	4
Monitoring (e.g., self-interest on behalf of an industry or cause)	5
Development/Technical advancement	9
Political/strategic involvement (e.g., lobbying to further a position)	0
Academic involvement to further science or career (e.g., for academics)	1
Total	22

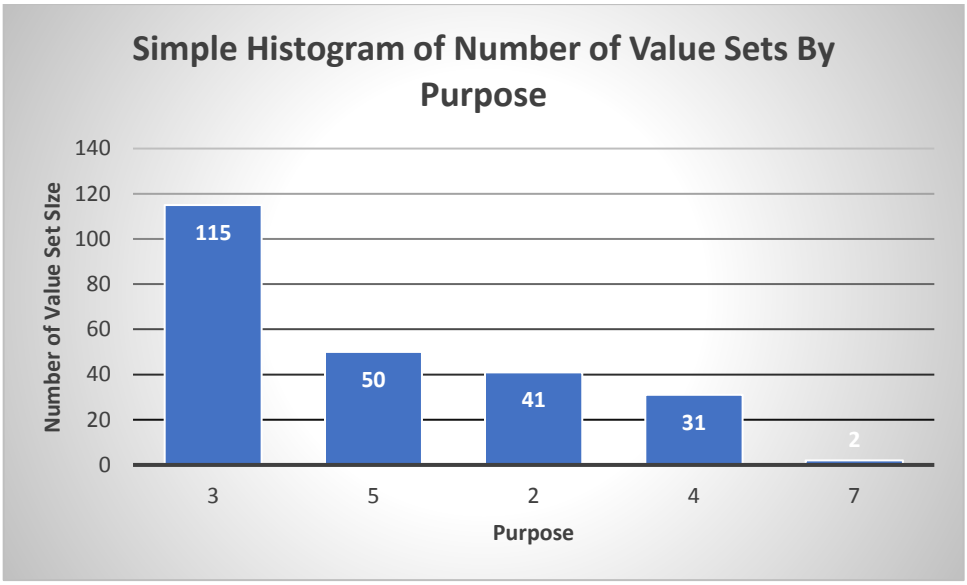

Figure 3.5. Simple Histogram of Number of Value Sets by Purpose

3. Data Analysis: ANOVA

The purpose of this analysis is to know the general variation or differences between groups in the data set. This test is suitable for the data sets we have because they are aligned with the reference of when we can use ANOVA. First, our independent variables (Domain Category, Domain, Steward, Vocabulary, Purpose) are all nominal with minimum three or more levels within the variable. Second, our dependent variable is continuous and normally distributed after we transformed them.[9] In this analysis, we used the Value Set Study (*See Appendix 2*) and the Intersection Size Datasets (*See Appendix 3).* The detail's ANOVA results for each of the test are available on Appendices (*See Appendix 4*). Below is the Summary of ANOVA Results and Comments.

Table 3.7. A Summary Table of Data Analysis using ANOVA

Dependent Variable	Independent Variable	df	F Statistics	P Value	Comment
Log 10 Value Set Size	Domain Category	7	7.22	0.0000	Domain Category is statistically significant influencing the size of the value set
Log 10 Value Set Size	Domain	40	15.92	0.0000	Domain is statistically significant influencing the size of the value set
Log 10 Value Set Size	Vocabulary	2	6.72	0.0014	Vocabulary is statistically significant influencing the size of the value set
Log 10 Value Set Size	Steward	21	0.60	0.92	Steward is not statistically significant influencing the size of the value set
Log 10 Value Set Size	Purpose	3	1.98	0.12	Purpose is not statistically significant influencing the size of the value set
Log 10 Intersection Size	Domain Category	7	13.33	0.0000	Domain Category is statistically significant influencing the size of Intersection
Log 10 Intersection Size	Domain	40	30.18	0.0000	Domain is statistically significant influencing the size of Intersection
Log 10 Intersection Size	Vocabulary	2	0.28	0.76	Vocabulary is not statistically significant influencing the size of the Intersection

a. Log 10 Value Set Size and Domain Category

Based on the ANOVA Summary Table above, the F Statistics is higher, and the P Value is zero. This indicates Domain Category is statistically significant in influencing the value set size. It shows variability between the group.

Figure 3.9 shows the variability of the value set size grouped by Domain Category. There is similar distribution such as on the Domain Category 6 and 7, their median almost the same. Their distribution is even. Domain Category 1 and 2 are obviously noticed that have many big numbers, a lot higher than Median. This reflects the real distribution where the value set size of Domain Category 1 and 2 Cancer and Diabetes) have hundreds even thousands.

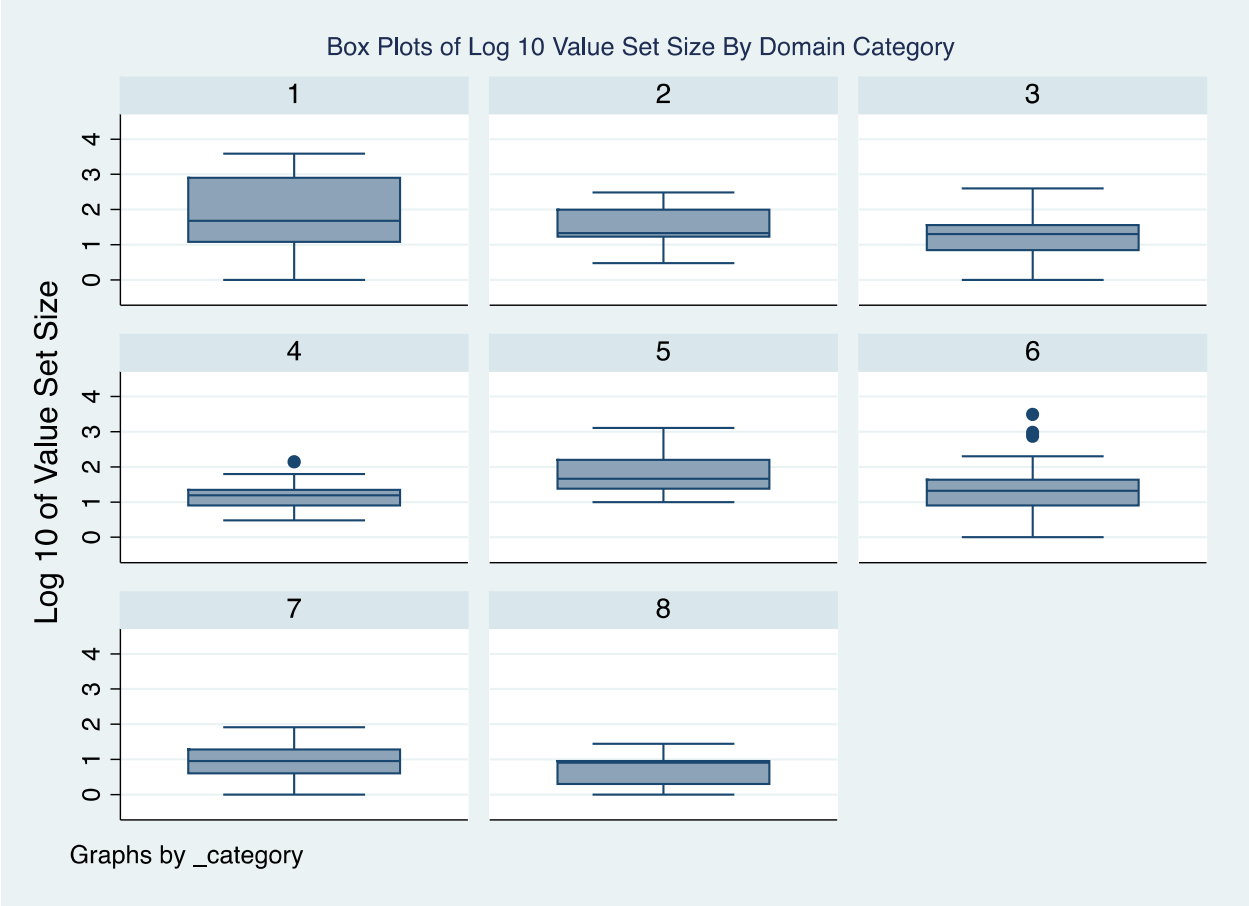

Figure 3.6. Box Plots of Log 10 Value Set Size per Domain Category

b. Log 10 Value Set Size and Domain

Based on the ANOVA Summary Table above, the F Statistics is higher, and the P Value is zero. This indicates Domain is statistically significant in influencing the value set size. Below are two examples of Box Plots of variability of value sets within different Domains. We can see, for example in Figure 3.7 that Domain 12 and 14 do not have a lot of variation. The maximum and minimum for both domains are 25% below and above the median. And on Figure 3.8, we can see that Domain 23 and 24 also do not have much variation, however, the number is higher above the median.

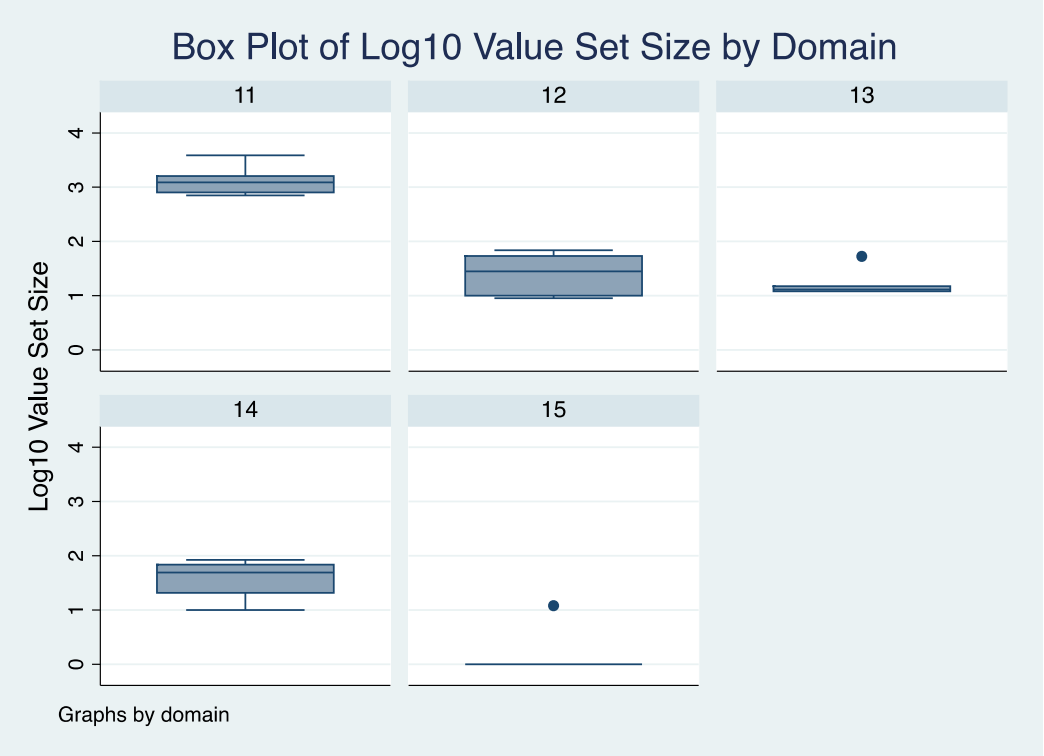

Figure 3.7. Box Plots of Log 10 Value Set Size and Domain (in Domain Category 1)

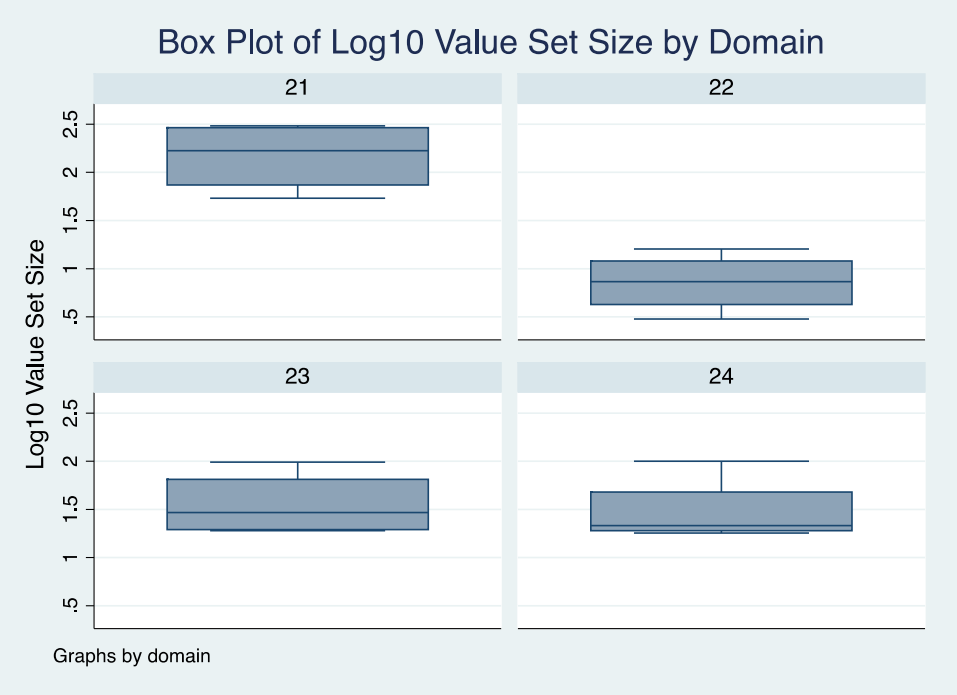

Figure 3.8. Box Plots of Log 10 Value Set Size and Domain (in Domain Category 2)

c. Log 10 Value Set Size and Vocabulary

The P value of ANOVA test for Log10 Value Set Size and Vocabulary is 0.0014. This indicates that Vocabulary is statistically significant in influencing the value set size. If we look at the box plots below (See Figure 3.9), the maximum and minimum as well as outliers which show a wider range indicating more variation. However, if we remove the outliers, the variation might be much less indicating low statistical significance.

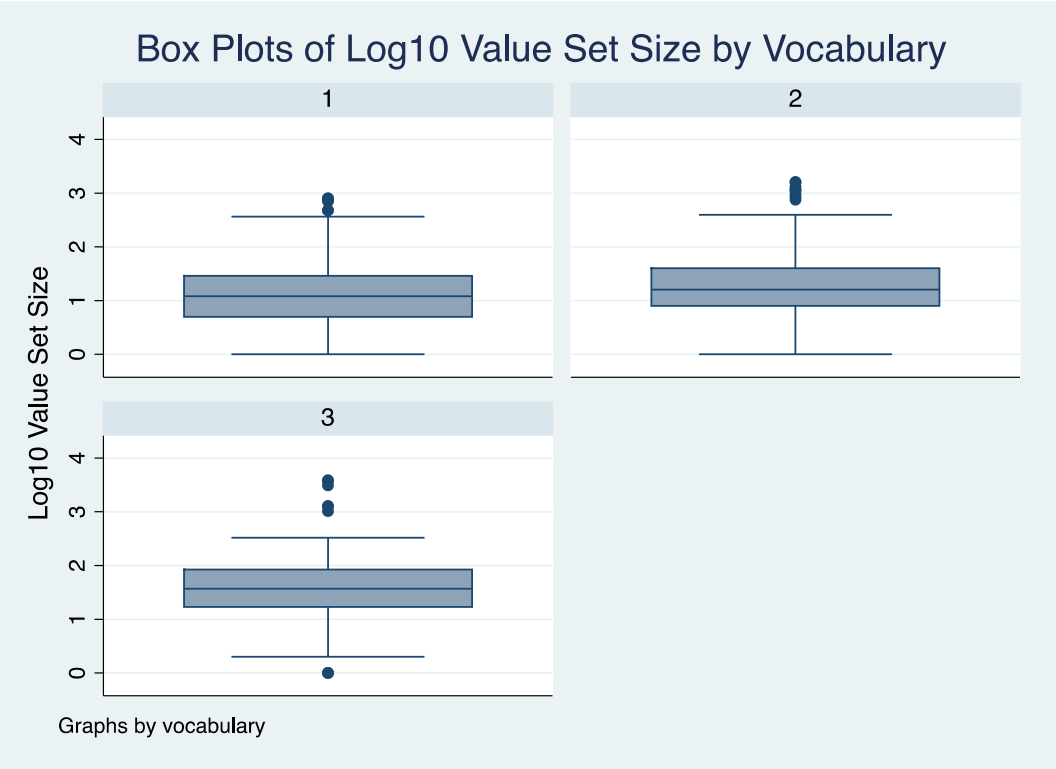

Figure 3.9. Box Plots of Log 10 Value Set Size and Vocabulary

d. Log 10 Value Set Size and Steward

ANOVA shows that the P value is higher than the F statistics. The P value of ANOVA test for Log10 Value Set Size and Steward is 0.92. This indicates that Steward is not statistically significant. In the box plot below (Figure 3.10), we can see that there is not much variability

among the stewards. There is some variability, however, it is only a small portion compared to the larger group.

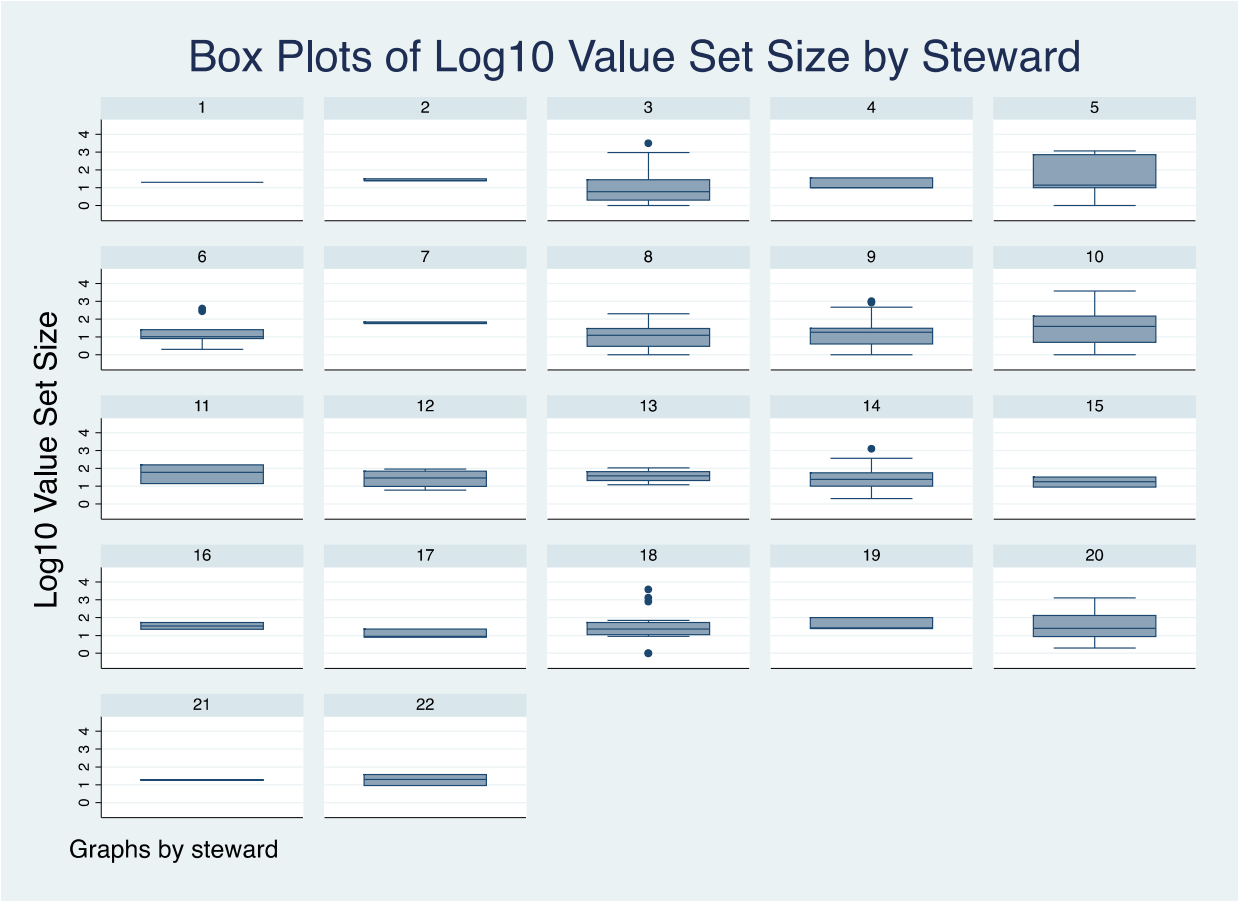

Figure 3.10. Box Plots of Log 10 Value Set Size and Steward

e. Log 10 Value Set Size and Purpose

ANOVA shows that the P value is low than the F statistics. The P value of ANOVA test for Log10 Value Set Size and Purpose is 0.12. When we see the box plot below (Figure 3.11) it is similar with Vocabulary in that there is not much variation. We can see variation between Purpose 2 and 7, however, it is still not statistically significant. The other 3 purposes are very similar.

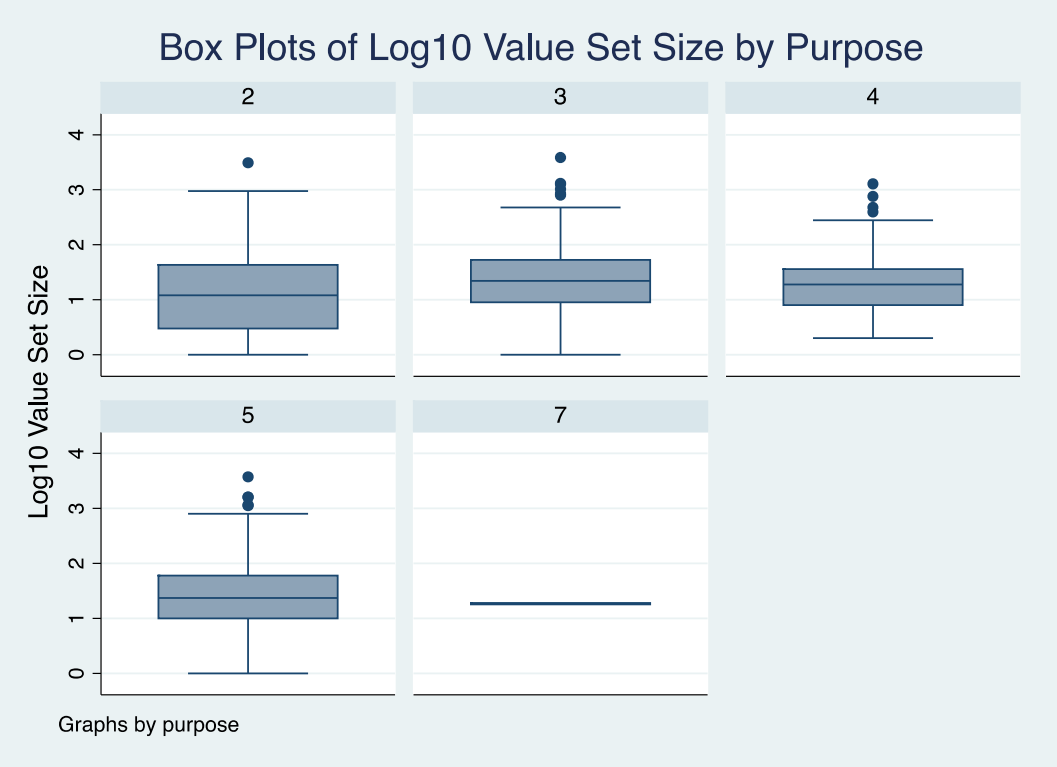

Figure 3.11. Box Plots of Log 10 Value Set Size and Steward

f. Log 10 Intersection Size and Domain Category

Based on the ANOVA Summary Table, the F Statistics is much higher than the P Value. This indicates Domain is statistically significant in influencing the intersection size. This is consistent with the previous test between Value Set and Domain Category. Figure 3.12 confirms this analysis. The box plots show significant variation. For example, Domain Category 1 indicates many value sets below the median, and Domains 3, 4, and 8 have a range evenly distributed between quartile 1 and 3.

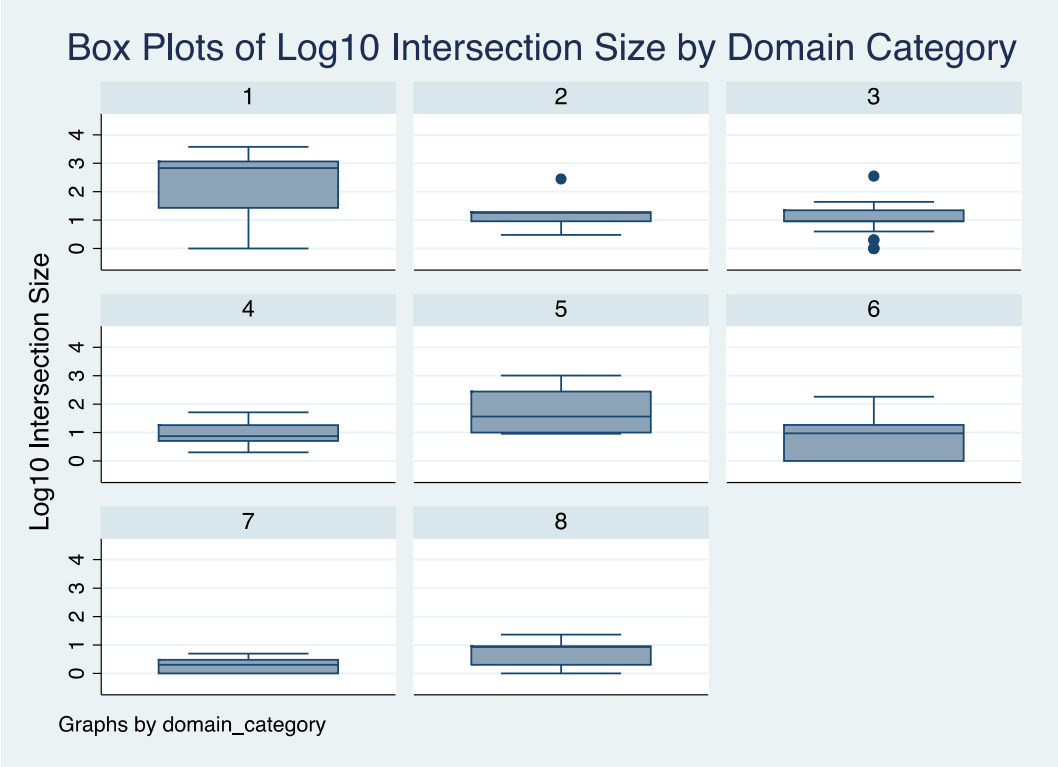

Figure 3.12. Box Plots of Log 10 Intersection Size and Domain Category

g. Log 10 Intersection Size and Domain

ANOVA shows that the P value is much lower than the F statistic. The P value of ANOVA test for Log10 Intersection Size and Domain is 0.00. This indicates a lot of variation. This is consistent with the box plots in the two figures below (See Figure 3.13 and 3.14). We again used domain values from domain category 1 and domain category two as examples. Figure 3.13 especially shows a lot of variation either high above the mean or much lower than the mean. For example, in Domain 11 there are lot of high values close to one another and we can only really see the outliers. And in Domain 15 the values are very low and there are no outliers. These are much different than the Domain values in Figure 3.14.

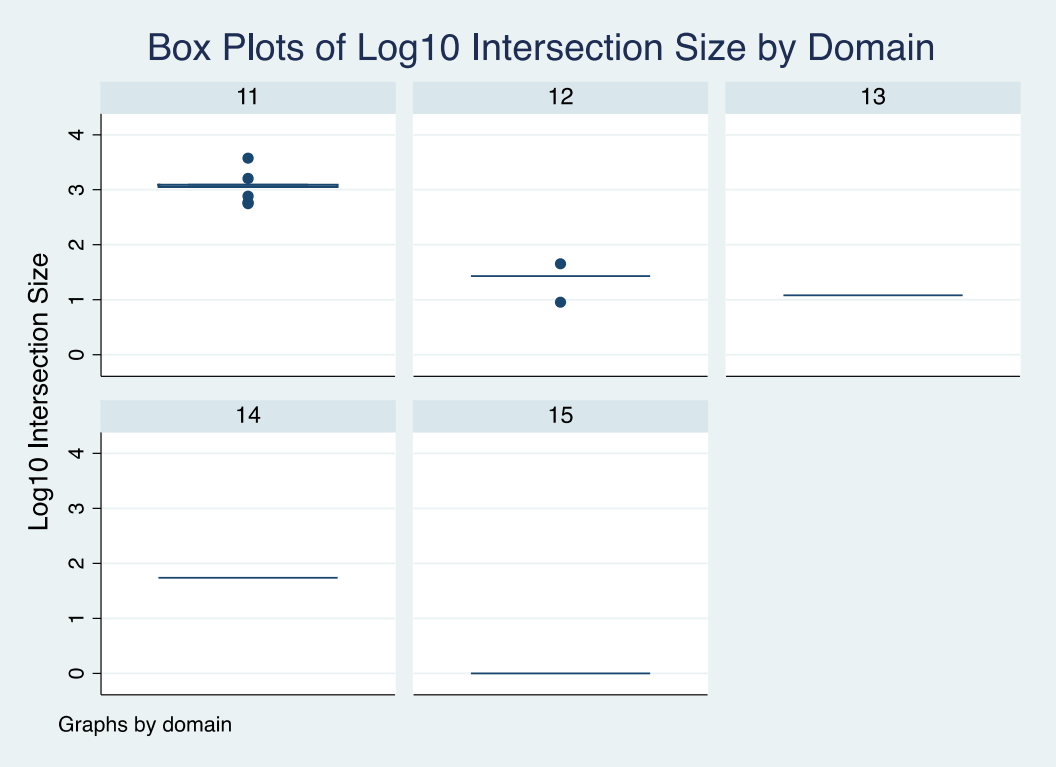

Figure 3.13. Box Plots of Log 10 Intersection Size and Domain (in Domain Category 1)

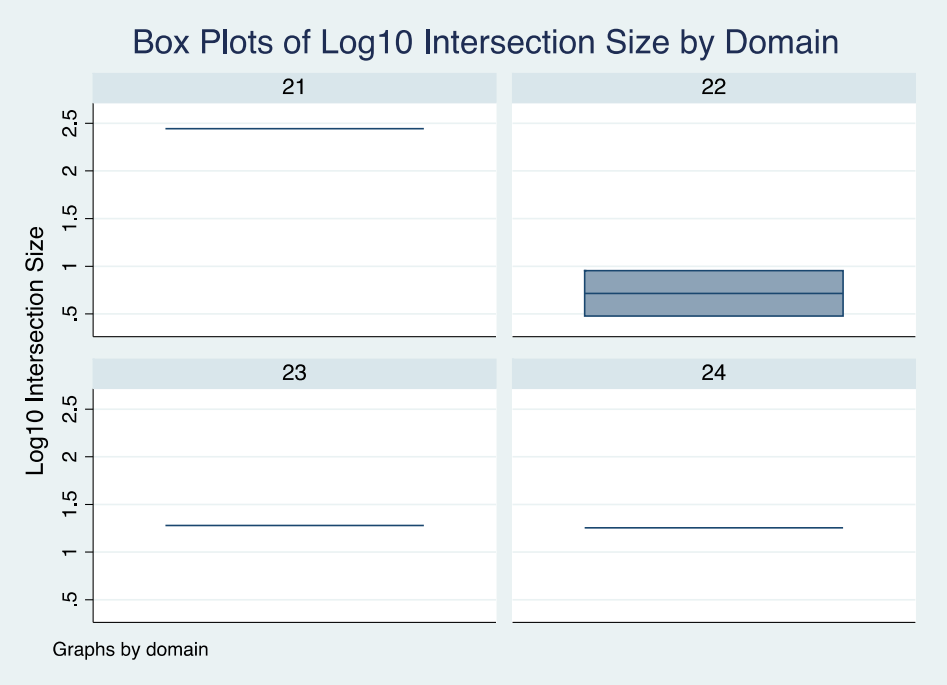

Figure 3.14. Box Plots of Log 10 Intersection Size and Domain (in Domain Category 2)

h. Log 10 Intersection Size and Vocabulary

ANOVA shows that the P value is higher than the F statistic but not by much. The P value of ANOVA test for Log10 Value Set Size and Steward is 0.76 and the F value is 0.28. This indicates that there is some variability, but not statistically significant. As shown in Figure 3.15, Vocabulary 1 has a shorter range for maximum and minimum than the other two vocabularies. All the vocabularies have high outliers. The medians are all similar ranging close to 1.

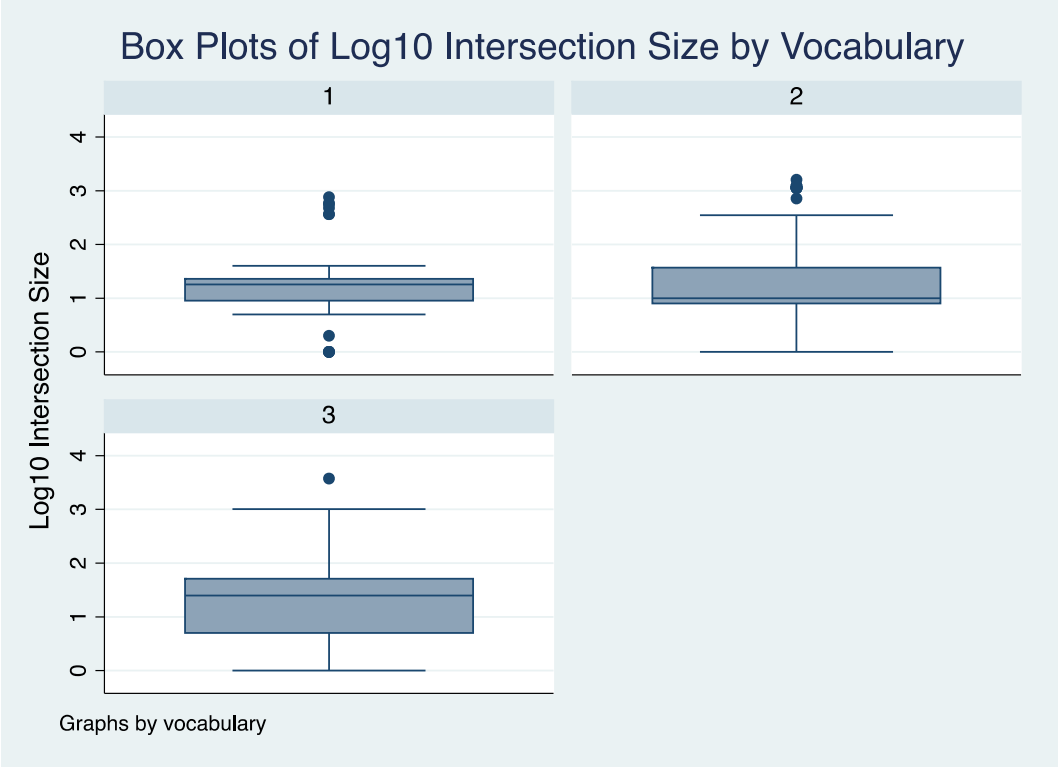

Figure 3.15. Box Plots of Log 10 Intersection Size and Steward

4. Data Analysis: Linear Regression

We used aggregate data from the Intersection Size Table. We categorized Value Set Size into groups based on the Purpose. The Value Set Size i was matched with Purpose i and Value Set

Size j, to Purpose j. Rows were deduplicated, so that each pair was represented only once in the table. Once the groups were created, we generated a mean value-set size in each group. This means allows us to have continuous value that can be used for Regression Analysis, because regression needs the dependent and variable to be continuous[9].

Based on the Linear Regression test we conducted (*See Table 3.8)*; we see that Purpose of Organization statistically significant correlate with the Value Set Size. It is confirmed by P Value less than 0.05, which are 0.006 and 0.002 of Log 10 Means of Value Set Size i per Purpose i and Log 10 Means of Value Set Size j per Purpose j respectively. Even though, Purpose i and j or Value Set i and j shared a common value, we make sure that there is no duplication in calculating the means (*See Appendix 5.)* The Coefficient (Coef.) also indicates that there is positive correlation between the Purpose of Steward and the Value Set Size because both Coef. Have positive numbers/results.

Table 3.8. Summary of Linear Regression Between Means Log 10 Intersection and Means of Value Sets per Purpose

Dependent Variable	Independent Variables	Coef.	P Value
Means of Log 10 Intersection	Means of Log Value Set Size i by Purpose i	0.517	0.006
	Means of Log Value Set Size j by Purpose j	0.603	0.002

IV. DISCUSSION

The question we are trying to answer is how much do the variables behind a value set from one Steward to another Steward with the same Domain intension correlate with the extension (contents) of the value set? And in another sense, does the Steward's role and purpose impact their choices of values in their value sets?

ANOVA results shows that all independent variables are statistically significant in influencing the value set size or showing variability, except Steward and purpose. W use the ANOVA indeed to know the variability between the group, not particularly answering the correlation. In order to know the correlation between Purpose of the Organization / Steward and Value Set Size, we should do regression test which we did in this study (*See Table 3.8*.). The result shows that there is a positive correlation between Purpose of the Organization / Steward and Value Set Size. This supports our hypothesis that the purpose of an organization or Steward impact the value set size.

Based on the results, we can see that the purpose of a Steward, provided that there is the same Domain intension, influences the content or value set sizes. Researchers or health providers who want to use the value sets should consider the purpose of the organization who creates the value sets, because it can impact the decision on which codes are used in the value sets. This will indirectly impact the false negatives and false positives in the results when capturing or identifying patients using the value sets.

We used value set size as a proxy for the real issue, which is the false-negative/false-positive tradeoff made by each organization in each measure. Since there are few gold standards in this area, it is difficult to provide a method for calculating FN and FP. In this study we only used VSAC

as our data set which has a relatively small data set. The availability of data was also limited. With that, we cannot accommodate the complexity of the Stewards that have more than one purpose.

We suggest for future research to collect more data so that Stewards with more than one purpose can be accommodated. Also, deeper analysis, for example, ANOVA contrast between groups can be done.

V. CONCLUSION

The goal of this research was to find out whether a statistical signal of a steward's purpose could be ascertained through viewing the length of the value sets or the lengths of the intersections of pairs of value sets, with the same domain intension. Per ANOVA, we didn't find much variability in both stewards or purpose. However, we did linear regression of the means of Log10 Value Set Size per Purpose and compared it with the Log10 Intersection Size as the dependent variable. The results supported our hypothesis that the purpose of an organization (log) is statistically significant with coefficients of 0.517 and 0.603 (which are both positive) and has a positive correlation with the value set size (P 0.006 and P 0.002).

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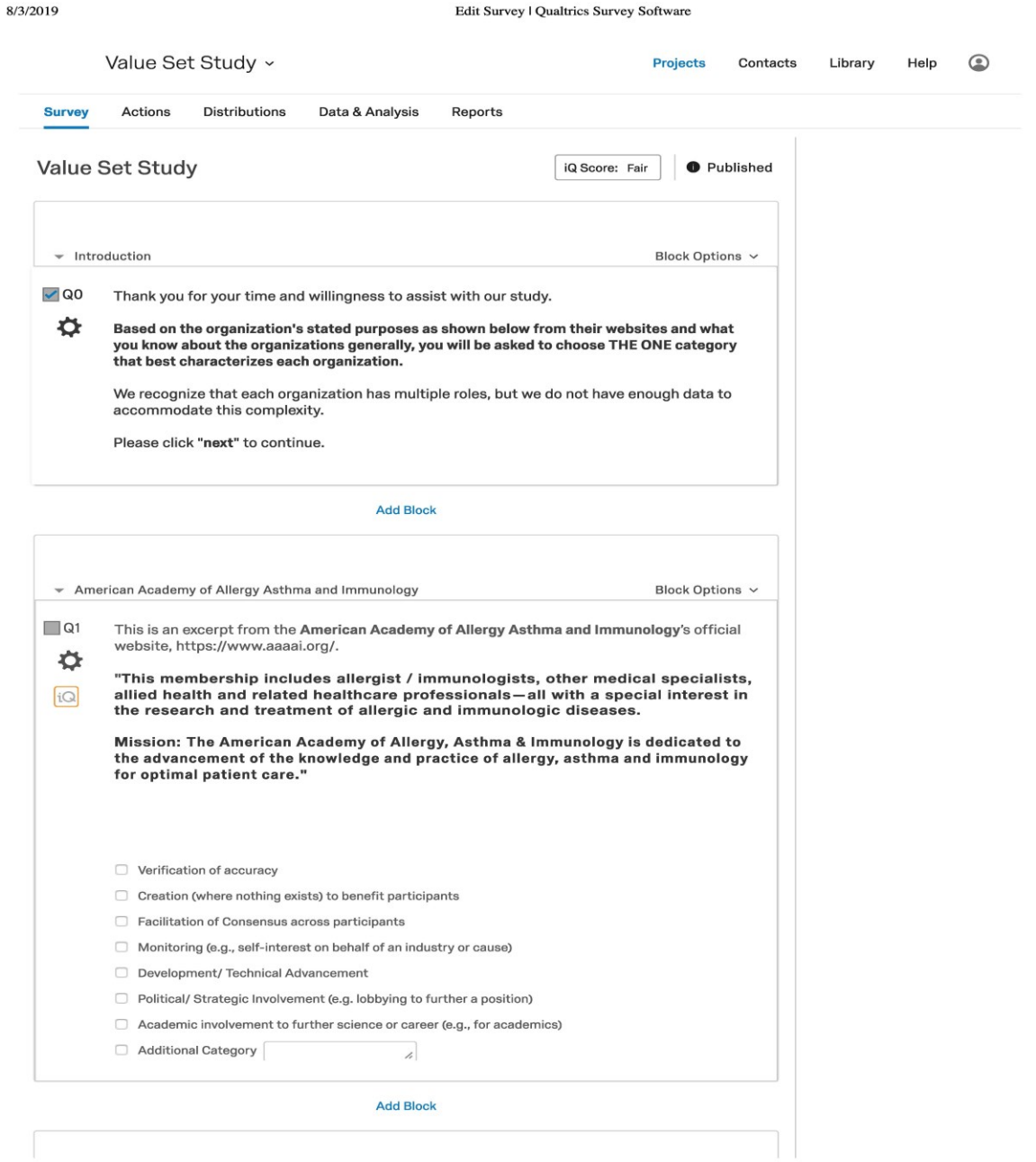
APPENDICES

Appendix 1. The Value Set Study (Interview Part B) Protocol



American Academy of Neurology Block Options

Q2

This is an excerpt from the **American Academy of Neurology**'s official website, https://www.aan.com/.

"Goals: Demonstrate and assert the value of neurology to policymakers and other major stakeholders; expand the neurology workforce to meet future needs for patient care; ensure the health of the organization by enhancing member satisfaction, well-being and engagement; provide resources to support the financial well-being of the practice of neurology; expand neuroscience training and research funding; educate and assist members in providing high-value clinical care; strengthen advocacy on behalf of members and their patients.

MISSION: To promote the highest quality patient-centered neurologic care and enhance member career satisfaction.

VISION: To be indispensable to our members."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

American College of Emergency Physicians/AMA-PCPI Block Options

Q3

This is an excerpt for the **American College of Emergency Physicians/AMA-PCPI**'s website, https://www.acep.org/.

"ACEP promotes the highest quality of emergency care and is the leading advocate for emergency physicians and their patients, and the public."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

American Medical Association Block Options

Q4

This is an excerpt about the **American Medical Association-convened Physician Consortium for Performance Improvement** from the PCPI Foundation's website, https://www.thepcpi.org/.

"In 2000, the American Medical Association (AMA) convened the Physician Consortium for Performance Improvement (AMA-convened PCPI) as a physician-led program to develop performance measures which addressed a significant gap in the measurement landscape. The AMA-convened PCPI, in partnership with its members, has developed more than 350 measures, many of which are used in the Physician Quality Reporting System (PQRS) and Meaningful Use, as well as private health plan payment models."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

American Society of Clinical Oncology Block Options

Q5

This is an excerpt from the **American Society of Clinical Oncology**'s official website,

"Mission: Conquering cancer through research, education, and promotion of the highest quality patient care.

Vision: A world where cancer is prevented or cured, and every survivor is healthy."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Change Healthcare Block Options

Q6

This is an excerpt from **Change Healthcare**'s official website, https://www.changehealthcare.com/.

"Change Healthcare is a catalyst for your value-based healthcare system. We are a healthcare technology company that offers software, analytics, network solutions, and technology-enabled services to help create a stronger, more collaborative healthcare system. We help deliver measurable value not only at the point of care, but also before, after, and in between care episodes."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
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- [ ] Additional Category

Add Block

College of American Pathologists Block Options

Q7

This is an excerpt from the **College of American Pathologists**' official website, https://www.cap.org/.

"Mission: The College of American Pathologists (CAP), the leading organization of board-certified pathologists, serves patients, pathologists, and the public by fostering and advocating excellence in the practice of pathology and laboratory medicine worldwide.

Vision: People are healthier because of excellence in the practice of pathology and laboratory medicine."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
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- [ ] Additional Category

Add Block

Council of State and Territorial Epidemiologists Block Options

Q8

This is an excerpt from the **Council of State and Territorial Epidemiologists'** official website, https://www.cste.org/.

"Mission: Promote effective use of epidemiologic data to guide public health practice and improve health; Support effective public health surveillance and epidemiologic practice through training, capacity development, and peer consultation; develop standards for practice; advocate for resources and scientifically based policy.

Vision: Using the power of epidemiology to improve the public's health"

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
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- [ ] Development/ Technical Advancement
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- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Lantana Block Options

Q9

This is an excerpt from **Lantana**'s official website, https://www.lantanagroup.com/.

"Lantana Consulting Group provides services and software for standards-based health information exchange.

Mission: Our work focuses on the benefits of EHR data management for quality reporting, public health reporting, research, and meaningful use of electronic records.

Vision: We want to see health information available across the spectrum of care, supporting safe, effective, affordable healthcare that improves well-being, public health, quality of care, and research."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Lewin Block Options

Q10

This is an excerpt from **Lewin**'s official website, http://www.lewin.com/.

"The Lewin Group provides health care and human services policy analytics and consulting to institutions, communities and governments.

The Lewin Group is a subsidiary of OptumServe™, a health services and innovation company that uses data and analytics to power modern health care. OptumServe is wholly owned by UnitedHealth Group, a health and well-being company dedicated to making the health system work better for everyone."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
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- [ ] Additional Category

Add Block

Mathematica Block Options

Q11

This is an excerpt from **Mathematica**'s official website, https://www.mathematica-mpr.com/.

"Mathematica is reimagining the way the world gathers and uses data, surfacing evidence that guides decisions in areas ranging from health, education, child welfare, and family support to nutrition, employment, disability, criminal justice, and international development.

Mission: to improve public well-being, we collaborate closely with our clients to improve programs, refine strategies, and enhance understanding."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

MITRE Block Options

Q12

This is an excerpt from **MITRE**'s official website, https://www.mitre.org/.

"MITRE works in the public interest to discover new possibilities, create unexpected opportunities, and lead by pioneering together for the public good to bring innovative ideas into existence.

Mission: MITRE's mission-driven team is dedicated to solving problems for a safer world."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

MN Community Measurement Block Options

Q13

This is an excerpt from the **MN Community Measurement**'s official website, https://mncm.org/.

"MN Community Measurement (MNCM) is a nonprofit, multi-stakeholder collaborative organization that empowers the community with data and information to drive improvement in health care cost and quality. Collaborators include physicians, hospitals and health systems, health plans, employers, consumers, and state government. MNCM specializes in developing, collecting, analyzing, and publicly reporting information on health care quality, cost, and patient experience."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

National Committee for Quality Assurance Block Options

Q14

This is an excerpt from the **National Committee for Quality Assurance**'s official website, https://www.ncqa.org/.

"The National Committee for Quality Assurance and reports on the quality of managed care plans, which allows purchasers and consumers to compare plans based on quality and make more informed health care purchasing decisions. NCQA efforts are organized around accreditation and performance measurement in areas such as member satisfaction, quality of care, access, and service."

- [ ] Verification of accuracy
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- [ ] Development/ Technical Advancement
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- [ ] Additional Category

Add Block

New Jersey Innovation Institute Block Options

Q15

This is an excerpt from the **New Jersey Innovation Institute**'s official website, https://njii.com/.

"We provide the link between industry and NJIT's top researchers and state-of-the-art facilities. We are an NJIT corporation that applies the intellectual and technological resources of the state's science and technology university to challenges identified by industry partners.

Vision: The New Jersey Innovation Institute will catalyze the renewal of New Jersey's key industrial sectors, resulting in better products, stronger companies, and vibrant clusters producing more jobs for New Jersey's citizens."

- [ ] Verification of accuracy
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- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
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- [ ] Additional Category

Add Block

Oncology Nursing Society Block Options

Q16

This is an excerpt from the **Oncology Nursing Society**'s official website, https://www.ons.org/.

"We innovate to create better care, we define excellence through oncology nursing research and promote practice based on the best available evidence, and we advocate for people throughout their cancer journey at the chairside, bedside, board room, and policy-making table.

Mission: to advance excellence in oncology nursing and quality cancer care.

Vision: to lead the transformation of cancer care."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Optum Block Options

Q17

This is an excerpt from **Optum**'s official website, https://www.optum.com/.

"Our aspiration is to improve experiences and outcomes for everyone we serve while reducing the total cost of care.

Optum delivers quality services and personalized engagement to manage the total cost of care, reduce risks and improve outcomes.

Optum connects the delivery of health care with the business of health care to reduce costs and enable growth."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

PCPI Foundation Block Options

Q18

This is an excerpt from the **PCPI Foundation**'s official website, https://www.thepcpi.org/.

"The PCPI's new Board of Directors and membership represents patients and consumers, health systems, hospitals, clinics, accrediting and licensing entities, employers, health plans, health information technology vendors, pharmacies, government agencies and quality improvement organizations as well as the historical members of physicians, health care professional organizations, and medical boards.

PCPI is now poised to facilitate partnerships and convene diverse perspectives to identify and implement solutions to improve the health care delivery system."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Quality Insights of Pennsylvania Block Options

Q19

This is an excerpt from **Quality Insights of Pennsylvania**'s official website,

"Quality Insights is a non-profit organization focused on using data and community solutions to improve healthcare quality in pursuit of better care, smarter spending and healthier people. We strive to be a change agent, trusted partner and integrator of organizations collaborating to improve care.

Mission: Bringing people and information together to improve health.

Vision: Our vision is that, through collaboration, the best health outcomes for every person are a top priority in every community."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

The Joint Comission Block Options

Q20

This is an excerpt from **The Joint Commission**'s official website, https://www.jointcommission.org/.

"An independent, not-for-profit organization, The Joint Commission is the nation's oldest and largest standards-setting and accrediting body in health care.

Mission: To continuously improve health care for the public, in collaboration with other stakeholders, by evaluating health care organizations and inspiring them to excel in providing safe and effective care of the highest quality and value.

Vision: All people always experience the safest, highest quality, best-value health care across all settings."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Vanderbilt University Electronic Medical Record and Genomics Network Block Options

Q21

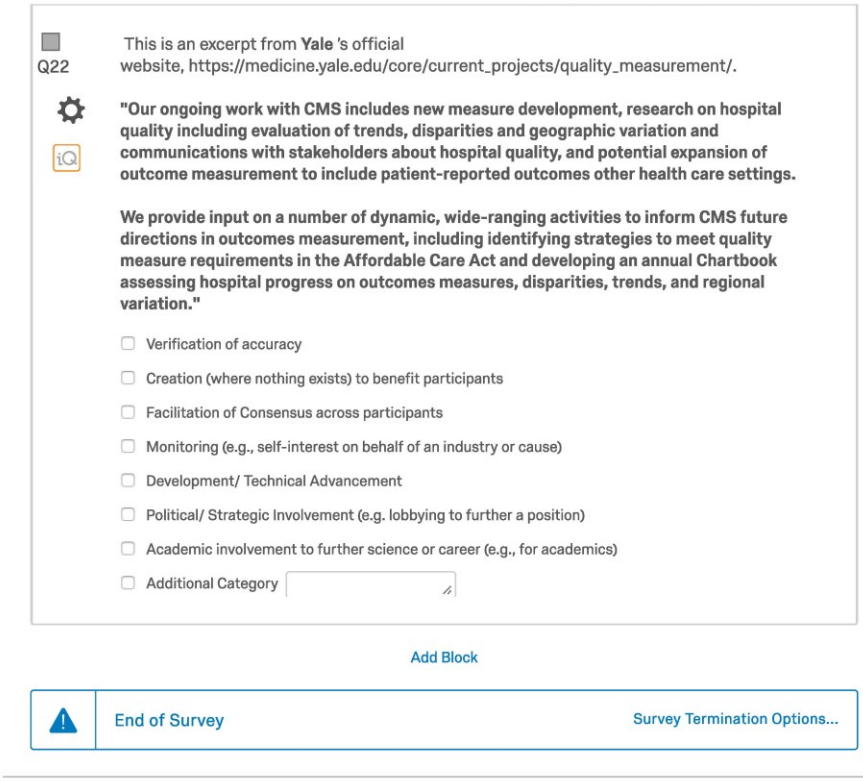
This is an excerpt from the **Vanderbilt University Electronic Medical Record and Genomics Network**'s website, https://emerge.mc.vanderbilt.edu/.

"The Electronic Medical Records and Genomics Network (eMERGE) is a National Human Genome Research Institute (NHGRI)-funded network tasked with developing methods and best practices for using electronic medical records and associated genetic data as a tool for genomic research. Ultimately, eMERGE hopes its efforts will result in improvements in health care, through safer and more effective prescription methodology, advancement of primary and secondary prevention strategies, and enhanced understanding of the biology of disease."

- [ ] Verification of accuracy
- [ ] Creation (where nothing exists) to benefit participants
- [ ] Facilitation of Consensus across participants
- [ ] Monitoring (e.g., self-interest on behalf of an industry or cause)
- [ ] Development/ Technical Advancement
- [ ] Political/ Strategic Involvement (e.g. lobbying to further a position)
- [ ] Academic involvement to further science or career (e.g., for academics)
- [ ] Additional Category

Add Block

Yale Block Options


Q22
This is an excerpt from Yale 's official website, https://medicine.yale.edu/core/current_projects/quality_measurement/.
"Our ongoing work with CMS includes new measure development, research on hospital quality including evaluation of trends, disparities and geographic variation and communications with stakeholders about hospital quality, and potential expansion of outcome measurement to include patient-reported outcomes other health care settings.
We provide input on a number of dynamic, wide-ranging activities to inform CMS future directions in outcomes measurement, including identifying strategies to meet quality measure requirements in the Affordable Care Act and developing an annual Chartbook assessing hospital progress on outcomes measures, disparities, trends, and regional variation."
Verification of accuracy
Creation (where nothing exists) to benefit participants
Facilitation of Consensus across participants
Monitoring (e.g., self-interest on behalf of an industry or cause)
Development/ Technical Advancement
Political/ Strategic Involvement (e.g. lobbying to further a position)
Academic involvement to further science or career (e.g., for academics)
Additional Category
Add Block
End of Survey
Survey Termination Options...

Appendix 2. Table of Data Dictionary

Code	Description
Domain11	Cancer
Domain11	Cancer Diagnosis
Domain11	Cancer Or Neoplasm
Domain11	Cancer SNOMED
Domain12	Breast Cancer
Domain13	Colorectal Cancer
Domain13	Malignant Neoplasm of Colon
Domain14	Malignant Melanoma of the Skin
Domain14	Malignant Melanoma of Skin
Domain15	Prostate cancer
Domain21	Diabetes
Domain22	Gestational Diabetes
Domain23	Type 1 Diabetes Mellitus, Type One Diabetes Mellitus, T1DM
Domain23	Type 1 Diabetes
Domain24	Type 2 Diabetes Mellitus, Type Two Diabetes Mellitus
Domain24	Type II Diabetes
Domain31	Acute Myocardial Infarction I10
Domain31	Acute Myocardial Infarction
Domain31	Acute Myocardial Infarction additional SNOMED CT codes
Domain31	AMI ICD-9
Domain31	AMI ICD-10
Domain31	Acute Myocardial Infarction (AMI)
Domain31	Acute Myocardial Infarction I9
Domain31	Acute Myocardial Infarction SM
Domain32	Acute Pulmonary Edema [Unspecified Cause] (SNOMED)
Domain32	Acute Pulmonary Edema [Unspecified Cause] (ICD10CM)
Domain32	Acute Pulmonary Edema
Domain33	Aortic Dissection
Domain34	Atrial Fibrillation/Flutter
Domain34	Atrial Fibrillation
Domain35	Cardiopulmonary arrest
Domain36	Heart Failure
Domain37	Hypertension
Domain38	Ischemic Vascular Disease
Domain39	Obstetrics VTE
Domain39	Obstetrics VTE ICD10CM
Domain39	Obstetrics VTE ICD9CM
Domain39	Obstetrics VTE SNOMED CT
Domain41	Asthma

Domain41	Asthma Diagnosis
Domain41	Asthma ICD-10
Domain41	Asthma ICD9CM
Domain41	Asthma Diagnosis ICD 10
Domain41	Asthma Diagnosis ICD 10
Domain42	Chronic Obstructive Pulmonary Diseases
Domain42	Chronic Obstructive Pulmonary Disease
Domain42	Chronic Obstructive Pulmonary Disease (COPD)
Domain42	COPD I10
Domain42	COPD I9
Domain42	COPD SM CT
Domain43	Dyspnea (SNOMED)
Domain43	Dyspnea (ICD10CM)
Domain43	Dyspnea, SNOMEDCT
Domain43	Dyspnea, ICD10
Domain43	Dyspnea, ICD9
Domain43	Dyspnea
Domain44	Pneumonia (SNOMED)
Domain44	Pneumonia (ICD10CM)
Domain44	Pneumonia
Domain44	Pneumonia I9
Domain44	Pneumonia SM CT
Domain44	Pneumonia ICD 10
Domain44	Pneumonia ICD 10
Domain51	Psychiatric/Mental Health Diagnosis
Domain51	Psychiatric/Mental Health Patients
Domain51	Psychiatric/Mental Health Diagnosis
Domain51	Mental Disorders ICD10CM
Domain51	Mental Disorders
Domain51	Mental Disorders SNOMED CT
Domain51	Mental Health Diagnoses
Domain52	Anxiety
Domain52	Anxiety Disorders ICD9
Domain52	Anxiety Disorders ICD10
Domain52	Anxiety Disorders SNOMED
Domain53	Bipolar Disorder
Domain53	Bipolar Diagnosis ICD9
Domain53	Bipolar Diagnosis ICD10
Domain53	Bipolar Diagnosis SNOMED
Domain54	Diagnosis (active) dementia ICD9
Domain54	Diagnosis (active) dementia ICD10

Domain54	Diagnosis (active) dementia SNOMED
Domain54	Dementia
Domain55	Major Depression
Domain55	Major Depressive Disorder New or Recurrent
Domain55	Major Depressive Disorder-Active
Domain61	Infection S
Domain61	Infection I9
Domain61	Infection I10
Domain61	Infection
Domain62	Measles (Disorders) (ICD10CM)
Domain62	Measles (Disorders) (SNOMED)
Domain62	Measles
Domain63	Mumps (Disorders) (SNOMED)
Domain63	Mumps (Disorders) (ICD10CM)
Domain63	Mumps
Domain64	Otitis Media (ICD10CM)
Domain64	Otitis Media (SNOMED)
Domain64	Otitis Media
Domain65	Rubella (Disorders) (ICD10CM)
Domain65	Rubella (Disorders) (SNOMED)
Domain65	Rubella
Domain66	Septic Shock
Domain67	Severe Sepsis
Domain68	Syphilis (Disorders) (SNOMED)
Domain68	Syphilis (Disorders) (ICD10CM)
Domain68	Syphilis
Domain71	Hematuria [Unspecified Cause] (ICD10CM)
Domain71	Hematuria [Unspecified Cause] (SNOMED)
Domain71	Hematuria
Domain72	Infections of the Kidney
Domain72	Infections of Kidney
Domain73	Renal Insufficiency
Domain81	Hepatitis A (Disorders) (ICD10CM)
Domain81	Hepatitis A (Disorders) (SNOMED)
Domain81	Hepatitis A
Domain82	Hepatitis B
Domain83	Jaundice (SNOMED)
Domain83	Jaundice (ICD10CM)
Domain83	Jaundice
OID001	2.16.840.1.113762.1.4.1116.229
OID002	2.16.840.1.113762.1.4.1116.230

OID003	2.16.840.1.113762.1.4.1116.366
OID004	2.16.840.1.113883.3.526.2.1077
OID005	2.16.840.1.113883.3.526.2.1078
OID006	2.16.840.1.113883.3.526.2.1079
OID007	2.16.840.1.113883.3.3157.1003.127
OID008	2.16.840.1.113883.3.3157.1004.28
OID009	2.16.840.1.113883.3.3157.1815
OID010	2.16.840.1.113883.3.3157.1832
OID011	2.16.840.1.113762.1.4.1047.362
OID012	2.16.840.1.113762.1.4.1116.183
OID013	2.16.840.1.113762.1.4.1116.184
OID014	2.16.840.1.113883.3.526.2.96
OID015	2.16.840.1.113883.3.526.2.97
OID016	2.16.840.1.113883.3.526.2.98
OID017	2.16.840.1.113883.3.1434.1000.1096
OID018	2.16.840.1.113762.1.4.1116.254
OID019	2.16.840.1.113762.1.4.1116.255
OID020	2.16.840.1.113883.3.464.1003.108.11.1001
OID021	2.16.840.1.113883.3.464.1003.108.11.1002
OID022	2.16.840.1.113883.3.464.1003.108.11.1003
OID023	2.16.840.1.113883.3.464.1003.108.11.1016
OID024	2.16.840.1.113883.3.464.1003.108.11.1017
OID025	2.16.840.1.113883.3.464.1003.108.11.1018
OID026	2.16.840.1.113883.3.1434.1039
OID027	2.16.840.1.113762.1.4.1116.217
OID028	2.16.840.1.113762.1.4.1116.306
OID029	2.16.840.1.113883.3.526.2.90
OID030	2.16.840.1.113883.3.526.2.91
OID031	2.16.840.1.113883.3.526.2.92
OID032	2.16.840.1.113762.1.4.1138.739
OID033	2.16.840.1.113883.3.464.1003.103.11.1001
OID034	2.16.840.1.113883.3.464.1003.103.11.1002
OID035	2.16.840.1.113883.3.464.1003.103.11.1003
OID036	2.16.840.1.113762.1.4.1032.82
OID037	2.16.840.1.113762.1.4.1032.89
OID038	2.16.840.1.113883.3.464.1003.103.11.1012
OID039	2.16.840.1.113883.3.464.1003.103.11.1014
OID040	2.16.840.1.113762.1.4.1053.1
OID041	2.16.840.1.113883.3.464.1003.103.11.1025
OID042	2.16.840.1.113883.3.464.1003.103.11.1026
OID043	2.16.840.1.113883.3.464.1003.103.11.1027

OID044	2.16.840.1.113762.1.4.1053.2
OID045	2.16.840.1.113883.3.464.1003.103.11.1030
OID046	2.16.840.1.113883.3.464.1003.103.11.1031
OID047	2.16.840.1.113883.3.464.1003.103.11.1034
OID048	2.16.840.1.113762.1.4.1045.182
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OID060	2.16.840.1.113883.3.666.5.3024
OID061	2.16.840.1.113762.1.4.1136.63
OID062	2.16.840.1.113883.3.3157.4044
OID063	2.16.840.1.113883.17.4077.2.1042
OID064	2.16.840.1.113883.17.4077.2.1058
OID065	2.16.840.1.113883.17.4077.2.1059
OID066	2.16.840.1.113883.3.117.1.7.1.244
OID067	2.16.840.1.113883.3.117.1.7.1.245
OID068	2.16.840.1.113883.3.117.1.7.1.246
OID069	2.16.840.1.113883.3.117.1.7.1.249
OID070	2.16.840.1.113883.17.4077.2.1003
OID071	2.16.840.1.113883.17.4077.2.1004
OID072	2.16.840.1.113883.17.4077.2.1005
OID073	2.16.840.1.113883.3.666.5.1081
OID074	2.16.840.1.113883.3.666.5.1082
OID075	2.16.840.1.113883.3.666.5.3020
OID076	2.16.840.1.113883.3.3157.4046
OID077	2.16.840.1.113883.3.3157.4047
OID078	2.16.840.1.113762.1.4.1138.604
OID079	2.16.840.1.113762.1.4.1182.92
OID080	2.16.840.1.113883.3.526.2.23
OID081	2.16.840.1.113883.3.526.2.24
OID082	2.16.840.1.113883.3.526.2.25
OID083	2.16.840.1.113883.3.464.1003.104.11.1036
OID084	2.16.840.1.113883.3.464.1003.104.11.1037

OID085	2.16.840.1.113883.3.464.1003.104.11.1038
OID086	2.16.840.1.113883.3.3157.4012
OID087	2.16.840.1.113883.3.3157.4021
OID088	2.16.840.1.113762.1.4.1138.562
OID089	2.16.840.1.113883.3.464.1003.104.11.1007
OID090	2.16.840.1.113883.3.464.1003.104.11.1008
OID091	2.16.840.1.113883.3.464.1003.104.11.1009
OID092	2.16.840.1.113762.1.4.1146.108
OID093	2.16.840.1.113762.1.4.1146.951
OID094	2.16.840.1.113883.17.4077.2.2017
OID095	2.16.840.1.113883.17.4077.2.2018
OID096	2.16.840.1.113883.17.4077.2.2019
OID097	2.16.840.1.113762.1.4.1047.308
OID098	2.16.840.1.113762.1.4.1195.26
OID099	2.16.840.1.113762.1.4.1195.27
OID100	2.16.840.1.113883.3.117.1.7.1.270
OID101	2.16.840.1.113883.3.117.1.7.1.904
OID102	2.16.840.1.113883.3.526.2.59
OID103	2.16.840.1.113883.3.526.2.60
OID104	2.16.840.1.113883.3.526.2.61
OID105	2.16.840.1.113762.1.4.1138.737
OID106	2.16.840.1.113883.3.464.1003.102.11.1019
OID107	2.16.840.1.113883.3.464.1003.102.11.1020
OID108	2.16.840.1.113883.3.464.1003.102.11.1021
OID109	2.16.840.1.113883.3.666.5.909
OID110	2.16.840.1.113883.3.666.5.918
OID111	2.16.840.1.113883.3.666.5.2135
OID112	2.16.840.1.113883.17.4077.2.2092
OID113	2.16.840.1.113762.1.4.1146.867
OID114	2.16.840.1.113762.1.4.1146.868
OID115	2.16.840.1.113762.1.4.1182.44
OID116	2.16.840.1.113762.1.4.1182.45
OID117	2.16.840.1.113762.1.4.1182.46
OID118	2.16.840.1.113883.3.7643.2.1009
OID119	2.16.840.1.113762.1.4.1146.357
OID120	2.16.840.1.113762.1.4.1146.712
OID121	2.16.840.1.113883.3.464.1003.102.11.1043
OID122	2.16.840.1.113883.3.464.1003.102.11.1044
OID123	2.16.840.1.113883.3.464.1003.102.11.1045
OID124	2.16.840.1.113883.3.666.5.756
OID125	2.16.840.1.113883.3.666.5.2152

OID126	2.16.840.1.113883.3.666.5.2161
OID127	2.16.840.1.113762.1.4.1195.41
OID128	2.16.840.1.113883.3.117.1.7.1.338
OID129	2.16.840.1.113883.3.117.1.7.1.339
OID130	2.16.840.1.113883.3.117.1.7.1.340
OID134	2.16.840.1.113883.3.117.1.7.1.296
OID135	2.16.840.1.113883.3.117.1.7.1.297
OID136	2.16.840.1.113883.3.117.1.7.1.298
OID137	2.16.840.1.113883.3.117.1.7.1.341
OID138	2.16.840.1.113883.3.117.1.7.1.342
OID139	2.16.840.1.113883.3.117.1.7.1.343
OID140	2.16.840.1.113883.3.464.1003.105.11.1010
OID141	2.16.840.1.113883.3.464.1003.105.11.1011
OID142	2.16.840.1.113883.3.464.1003.105.11.1012
OID143	2.16.840.1.113762.1.4.1032.47
OID144	2.16.840.1.113762.1.4.1032.48
OID145	2.16.840.1.113883.3.1240.2017.3.2.1015
OID146	2.16.840.1.113883.3.1240.2017.3.2.1016
OID147	2.16.840.1.113883.3.1240.2017.3.2.1017
OID148	2.16.840.1.113883.3.67.1.101.1.43
OID149	2.16.840.1.113883.3.67.1.101.1.44
OID150	2.16.840.1.113883.3.67.1.101.1.45
OID151	2.16.840.1.113883.3.464.1003.105.11.1191
OID152	2.16.840.1.113883.3.464.1003.105.11.1192
OID153	2.16.840.1.113883.3.464.1003.105.11.1193
OID154	2.16.840.1.113883.3.600.447
OID155	2.16.840.1.113883.3.600.448
OID156	2.16.840.1.113883.3.600.449
OID157	2.16.840.1.113762.1.4.1034.88
OID158	2.16.840.1.113762.1.4.1034.89
OID159	2.16.840.1.113762.1.4.1034.90
OID160	2.16.840.1.113883.3.3157.4032
OID161	2.16.840.1.113883.3.3157.4033
OID162	2.16.840.1.113762.1.4.1080.3
OID163	2.16.840.1.113883.3.464.1003.105.11.1017
OID164	2.16.840.1.113883.3.464.1003.105.11.1018
OID165	2.16.840.1.113883.3.464.1003.105.11.1019
OID166	2.16.840.1.113883.3.526.2.347
OID167	2.16.840.1.113883.3.526.2.556
OID168	2.16.840.1.113883.3.526.2.557
OID169	2.16.840.1.113883.3.526.2.1912

OID170	2.16.840.1.113883.3.526.2.1918
OID171	2.16.840.1.113883.3.526.2.1922
OID172	2.16.840.1.113762.1.4.1146.126
OID173	2.16.840.1.113762.1.4.1146.127
OID174	2.16.840.1.113883.3.464.1003.110.11.1078
OID175	2.16.840.1.113883.3.464.1003.110.11.1079
OID176	2.16.840.1.113883.3.464.1003.110.11.1080
OID177	2.16.840.1.113762.1.4.1146.115
OID178	2.16.840.1.113762.1.4.1146.117
OID179	2.16.840.1.113883.3.464.1003.110.11.1087
OID180	2.16.840.1.113883.3.464.1003.110.11.1088
OID181	2.16.840.1.113883.3.464.1003.110.11.1089
OID182	2.16.840.1.113762.1.4.1146.105
OID183	2.16.840.1.113762.1.4.1146.106
OID184	2.16.840.1.113883.3.464.1003.110.11.110
OID185	2.16.840.1.113883.3.464.1003.110.11.1098
OID186	2.16.840.1.113883.3.464.1003.110.11.1099
OID187	2.16.840.1.113762.1.4.1146.395
OID188	2.16.840.1.113762.1.4.1146.396
OID189	2.16.840.1.113883.3.464.1003.112.11.1004
OID190	2.16.840.1.113883.3.464.1003.112.11.1005
OID191	2.16.840.1.113883.3.464.1003.112.11.1006
OID192	2.16.840.1.113762.1.4.1146.933
OID193	2.16.840.1.113762.1.4.1146.934
OID194	2.16.840.1.113883.3.3157.1008
OID195	2.16.840.1.113883.3.3157.1020
OID196	2.16.840.1.113883.3.464.1003.112.11.1013
OID197	2.16.840.1.113883.3.464.1003.112.11.1014
OID198	2.16.840.1.113883.3.464.1003.112.11.1015
OID199	2.16.840.1.113883.3.3157.1009
OID200	2.16.840.1.113883.3.3157.1021
OID201	2.16.840.1.113762.1.4.1116.455
OID202	2.16.840.1.113762.1.4.1116.456
OID203	2.16.840.1.113883.3.3157.1325
OID204	2.16.840.1.113883.3.3157.1330
OID205	2.16.840.1.113762.1.4.1146.94
OID206	2.16.840.1.113762.1.4.1146.95
OID207	2.16.840.1.113883.3.464.1003.110.11.1068
OID208	2.16.840.1.113883.3.464.1003.110.11.1069
OID209	2.16.840.1.113883.3.464.1003.110.11.1070
OID210	2.16.840.1.113883.3.67.1.101.1.270

OID211	2.16.840.1.113883.3.67.1.101.1.271
OID212	2.16.840.1.113883.3.67.1.101.1.272
OID213	2.16.840.1.113883.3.464.1003.110.11.1071
OID214	2.16.840.1.113883.3.464.1003.110.11.1072
OID215	2.16.840.1.113883.3.464.1003.110.11.1073
OID216	2.16.840.1.113762.1.4.1146.650
OID217	2.16.840.1.113762.1.4.1146.651
OID218	2.16.840.1.113883.3.3157.1010
OID219	2.16.840.1.113883.3.3157.1022
OID220	2.16.840.1.113883.3.666.5.1705
OID221	2.16.840.1.113883.3.666.5.1706
OID222	2.16.840.1.113883.3.666.5.1707
OID223	2.16.840.1.113883.17.4077.2.2073
OID224	2.16.840.1.113883.17.4077.2.2074
OID225	2.16.840.1.113883.17.4077.2.2075
OID226	2.16.840.1.113762.1.4.1146.721
OID227	2.16.840.1.113762.1.4.1146.722
OID228	2.16.840.1.113883.3.464.1003.119.11.1001
OID229	2.16.840.1.113883.3.464.1003.119.11.1002
OID230	2.16.840.1.113883.3.464.1003.119.11.1003
OID231	2.16.840.1.113762.1.4.1045.89
OID232	2.16.840.1.113762.1.4.1045.90
OID233	2.16.840.1.113762.1.4.1111.59
OID234	2.16.840.1.113762.1.4.1111.60
OID235	2.16.840.1.113883.3.666.5.2602
OID236	2.16.840.1.113883.17.4077.2.2060
OID237	2.16.840.1.113762.1.4.1045.87
OID238	2.16.840.1.113762.1.4.1045.88
OID239	2.16.840.1.113883.3.666.5.2601
OID240	2.16.840.1.113883.17.4077.2.2049
OID241	2.16.840.1.113883.17.4077.2.2050
OID242	2.16.840.1.113883.17.4077.2.2051
Steward01	American Academy of Allergy Asthma and Immunology
Steward01	American Academy of Allergy Asthma and Immunology
Steward02	American Academy of Neurology
Steward03	American College of Emergency Physicians/AMA-PCPI
Steward04	American Medical Association-convened Physician Consortium for Performance Improvement(R)

Steward05	American Society of Clinical Oncology
Steward06	Change Healthcare
Steward07	College of American Pathologists Steward
Steward07	College of American Pathologists Steward
Steward08	Council of State and Territorial Epidemiologists Steward
Steward09	Lantana
Steward10	Lewin EH Steward
Steward10	Lewin EP Steward
Steward11	Mathematica
Steward12	MITRE
Steward13	MN Community Measurement
Steward14	National Committee for Quality Assurance
Steward15	New Jersey Innovation Institute
Steward16	Oncology Nursing Society
Steward17	Optum
Steward18	PCPI Foundation
Steward18	PCPI Foundation
Steward19	Quality Insights of Pennsylvania
Steward20	The Joint Commission
Steward21	Vanderbilt University Electronic Medical Record and Genomics Network
Steward22	Yale
Vocab1	ICD9CM
Vocab2	ICD10CM
Vocab3	SNOMEDCT

Purpose1	Verification of accuracy
Purpose2	Creation (where nothing exists) to benefit participants
Purpose3	Facilitation of consensus across participants
Purpose4	Monitoring (e.g., self-interest on behalf of an industry or cause)
Purpose5	Development/Technical advancement
Purpose6	Political/strategic involvement (e.g., lobbying to further a position)
Purpose7	Academic involvement to further science or career (e.g., for academics)

Appendix 3. Table of Value Set Size DataSet

Domain Category	Domain	Steward	Purpose	Vocabulary	OID	Value Set Size
DomainCategory8	Domain83	Steward08	2	Vocab3	OID216	8
DomainCategory1	Domain11	Steward05	5	Vocab2	OID003	1160
DomainCategory3	Domain35	Steward10	5	Vocab3	OID077	51
DomainCategory6	Domain68	Steward08	2	Vocab2	OID188	96
DomainCategory3	Domain34	Steward03	2	Vocab1	OID070	1
DomainCategory6	Domain63	Steward08	2	Vocab2	OID178	13
DomainCategory5	Domain54	Steward02	5	Vocab2	OID158	25
DomainCategory3	Domain36	Steward18	3	Vocab1	OID080	24
DomainCategory4	Domain43	Steward06	4	Vocab1	OID117	4
DomainCategory6	Domain64	Steward08	2	Vocab2	OID227	43
DomainCategory1	Domain13	Steward05	5	Vocab2	OID019	12
DomainCategory3	Domain33	Steward03	2	Vocab2	OID065	4
DomainCategory3	Domain33	Steward03	2	Vocab1	OID064	4
DomainCategory1	Domain11	Steward18	3	Vocab1	OID004	796
DomainCategory4	Domain44	Steward14	3	Vocab1	OID122	29
DomainCategory7	Domain72	Steward14	3	Vocab1	OID197	9
DomainCategory8	Domain82	Steward17	4	Vocab2	OID211	8
DomainCategory5	Domain53	Steward19	4	Vocab1	OID154	24
DomainCategory8	Domain81	Steward14	3	Vocab1	OID208	2
DomainCategory7	Domain71	Steward10	5	Vocab1	OID194	4
DomainCategory8	Domain83	Steward08	2	Vocab2	OID217	2
DomainCategory6	Domain67	Steward03	2	Vocab1	OID240	1
DomainCategory3	Domain31	Steward22	5	Vocab2	OID048	9
DomainCategory1	Domain12	Steward16	5	Vocab2	OID011	54
DomainCategory1	Domain12	Steward18	3	Vocab2	OID015	27
DomainCategory4	Domain42	Steward03	2	Vocab3	OID112	56
DomainCategory1	Domain12	Steward18	3	Vocab1	OID014	9
DomainCategory6	Domain62	Steward14	3	Vocab2	OID176	8
DomainCategory1	Domain14	Steward14	3	Vocab2	OID025	43
DomainCategory1	Domain11	Steward18	3	Vocab2	OID005	1307

DomainCategory2	Domain22	Steward14	3	Vocab3	OID038	3
DomainCategory1	Domain15	Steward05	5	Vocab1	OID027	1
DomainCategory6	Domain65	Steward14	3	Vocab3	OID185	21
DomainCategory4	Domain43	Steward06	4	Vocab3	OID115	8
DomainCategory6	Domain62	Steward14	3	Vocab3	OID174	15
DomainCategory2	Domain22	Steward12	5	Vocab2	OID036	16
DomainCategory5	Domain54	Steward10	5	Vocab3	OID161	115
DomainCategory1	Domain11	Steward10	5	Vocab2	OID007	1601
DomainCategory5	Domain52	Steward11	5	Vocab1	OID145	14
DomainCategory5	Domain51	Steward09	3	Vocab1	OID135	477
DomainCategory1	Domain15	Steward18	3	Vocab2	OID030	1
DomainCategory7	Domain73	Steward10	5	Vocab1	OID203	53
DomainCategory1	Domain11	Steward10	5	Vocab2	OID010	1602
DomainCategory5	Domain53	Steward13	3	Vocab1	OID148	40
DomainCategory3	Domain33	Steward03	2	Vocab3	OID063	6
DomainCategory4	Domain41	Steward20	4	Vocab1	OID101	11
DomainCategory1	Domain12	Steward07	2	Vocab3	OID017	69
DomainCategory6	Domain64	Steward14	3	Vocab3	OID228	35
DomainCategory3	Domain35	Steward10	5	Vocab2	OID076	10
DomainCategory3	Domain31	Steward14	3	Vocab3	OID053	47
DomainCategory8	Domain81	Steward14	3	Vocab3	OID207	14
DomainCategory6	Domain65	Steward08	2	Vocab2	OID182	12
DomainCategory5	Domain53	Steward14	3	Vocab2	OID152	37
DomainCategory3	Domain32	Steward08	2	Vocab2	OID093	1
DomainCategory7	Domain71	Steward08	2	Vocab2	OID192	2
DomainCategory8	Domain82	Steward17	4	Vocab3	OID212	23
DomainCategory3	Domain39	Steward20	4	Vocab1	OID129	35
DomainCategory3	Domain38	Steward14	3	Vocab3	OID091	330
DomainCategory8	Domain82	Steward14	3	Vocab1	OID214	9
DomainCategory3	Domain31	Steward09	3	Vocab1	OID056	20
DomainCategory5	Domain52	Steward11	5	Vocab3	OID147	159
DomainCategory3	Domain32	Steward03	2	Vocab2	OID095	2
DomainCategory8	Domain81	Steward08	2	Vocab2	OID205	3
DomainCategory4	Domain43	Steward16	5	Vocab3	OID118	22
DomainCategory6	Domain67	Steward03	2	Vocab2	OID241	1
DomainCategory3	Domain31	Steward09	3	Vocab1	OID051	20
DomainCategory6	Domain67	Steward09	3	Vocab3	OID239	56
DomainCategory6	Domain66	Steward09	3	Vocab2	OID232	4
DomainCategory3	Domain31	Steward14	3	Vocab1	OID054	31
DomainCategory6	Domain66	Steward09	3	Vocab1	OID231	3
DomainCategory3	Domain38	Steward14	3	Vocab2	OID090	351

DomainCategory3	Domain35	Steward09	3	Vocab2	OID074	9
DomainCategory6	Domain63	Steward14	3	Vocab2	OID181	11
DomainCategory3	Domain34	Steward20	4	Vocab1	OID066	2
DomainCategory1	Domain14	Steward14	3	Vocab1	OID024	10
DomainCategory6	Domain61	Steward03	2	Vocab3	OID225	3093
DomainCategory3	Domain35	Steward09	3	Vocab1	OID073	3
DomainCategory8	Domain82	Steward14	3	Vocab3	OID213	28
DomainCategory6	Domain67	Steward09	3	Vocab2	OID238	37
DomainCategory1	Domain15	Steward05	5	Vocab2	OID028	1
DomainCategory7	Domain72	Steward10	5	Vocab1	OID199	5
DomainCategory4	Domain41	Steward18	3	Vocab1	OID102	14
DomainCategory4	Domain41	Steward18	3	Vocab2	OID103	18
DomainCategory4	Domain44	Steward09	3	Vocab1	OID124	22
DomainCategory3	Domain31	Steward06	4	Vocab2	OID049	9
DomainCategory1	Domain13	Steward05	5	Vocab1	OID018	12
DomainCategory5	Domain53	Steward14	3	Vocab3	OID153	96
DomainCategory3	Domain34	Steward20	4	Vocab3	OID068	19
DomainCategory5	Domain55	Steward14	3	Vocab2	OID165	12
DomainCategory6	Domain66	Steward09	3	Vocab1	OID233	1
DomainCategory6	Domain66	Steward03	2	Vocab3	OID236	28
DomainCategory1	Domain15	Steward18	3	Vocab1	OID029	1
DomainCategory3	Domain36	Steward18	3	Vocab3	OID082	71
DomainCategory6	Domain66	Steward09	3	Vocab3	OID235	13
DomainCategory3	Domain32	Steward08	2	Vocab3	OID092	1
DomainCategory6	Domain61	Steward09	3	Vocab1	OID221	4
DomainCategory3	Domain39	Steward20	4	Vocab2	OID128	36
DomainCategory3	Domain36	Steward18	3	Vocab2	OID081	22
DomainCategory3	Domain32	Steward03	2	Vocab3	OID096	14
DomainCategory6	Domain68	Steward14	3	Vocab1	OID190	68
DomainCategory2	Domain21	Steward14	3	Vocab1	OID033	54
DomainCategory5	Domain51	Steward14	3	Vocab2	OID142	291
DomainCategory6	Domain68	Steward08	2	Vocab3	OID187	201
DomainCategory5	Domain55	Steward04	4	Vocab3	OID167	36
DomainCategory6	Domain63	Steward08	2	Vocab3	OID177	21
DomainCategory1	Domain14	Steward14	3	Vocab3	OID023	84
DomainCategory8	Domain83	Steward10	5	Vocab2	OID219	1
DomainCategory6	Domain64	Steward14	3	Vocab2	OID230	40
DomainCategory5	Domain54	Steward02	5	Vocab1	OID157	25
DomainCategory4	Domain44	Steward14	3	Vocab2	OID123	23
DomainCategory3	Domain33	Steward10	5	Vocab3	OID062	41
DomainCategory3	Domain31	Steward09	3	Vocab2	OID057	14

DomainCategory4	Domain42	Steward14	3	Vocab1	OID107	4
DomainCategory4	Domain42	Steward09	3	Vocab2	OID110	3
DomainCategory3	Domain37	Steward14	3	Vocab1	OID084	33
DomainCategory4	Domain41	Steward15	5	Vocab1	OID099	9
DomainCategory4	Domain42	Steward06	4	Vocab2	OID105	12
DomainCategory4	Domain44	Steward09	3	Vocab2	OID126	22
DomainCategory6	Domain64	Steward08	2	Vocab3	OID226	97
DomainCategory8	Domain82	Steward17	4	Vocab1	OID210	9
DomainCategory7	Domain72	Steward10	5	Vocab2	OID200	4
DomainCategory6	Domain62	Steward08	2	Vocab3	OID173	19
DomainCategory2	Domain23	Steward14	3	Vocab1	OID041	20
DomainCategory5	Domain51	Steward09	3	Vocab2	OID134	848
DomainCategory5	Domain53	Steward14	3	Vocab1	OID151	40
DomainCategory4	Domain41	Steward15	5	Vocab2	OID098	18
DomainCategory7	Domain73	Steward10	5	Vocab2	OID204	82
DomainCategory6	Domain65	Steward08	2	Vocab3	OID183	30
DomainCategory5	Domain52	Steward11	5	Vocab2	OID146	60
DomainCategory7	Domain73	Steward05	5	Vocab2	OID202	19
DomainCategory3	Domain34	Steward20	4	Vocab2	OID067	7
DomainCategory3	Domain37	Steward14	3	Vocab2	OID085	14
DomainCategory4	Domain41	Steward20	4	Vocab2	OID100	18
DomainCategory2	Domain23	Steward14	3	Vocab3	OID043	43
DomainCategory6	Domain65	Steward14	3	Vocab2	OID184	8
DomainCategory3	Domain34	Steward03	2	Vocab2	OID071	4
DomainCategory4	Domain42	Steward14	3	Vocab2	OID108	3
DomainCategory2	Domain22	Steward14	3	Vocab2	OID039	9
DomainCategory1	Domain11	Steward18	3	Vocab3	OID006	3850
DomainCategory3	Domain31	Steward14	3	Vocab2	OID055	12
DomainCategory2	Domain24	Steward14	3	Vocab1	OID047	20
DomainCategory6	Domain66	Steward09	3	Vocab2	OID234	1
DomainCategory5	Domain54	Steward10	5	Vocab2	OID160	16
DomainCategory5	Domain52	Steward12	5	Vocab3	OID144	91
DomainCategory5	Domain55	Steward04	4	Vocab2	OID168	10
DomainCategory1	Domain12	Steward18	3	Vocab3	OID016	48
DomainCategory4	Domain44	Steward09	3	Vocab3	OID125	17
DomainCategory1	Domain14	Steward07	2	Vocab3	OID026	56
DomainCategory2	Domain24	Steward14	3	Vocab2	OID046	100
DomainCategory5	Domain51	Steward09	3	Vocab3	OID136	1028
DomainCategory4	Domain41	Steward01	5	Vocab2	OID097	20
DomainCategory6	Domain61	Steward03	2	Vocab1	OID223	744
DomainCategory3	Domain31	Steward09	3	Vocab2	OID052	9

DomainCategory3	Domain36	Steward06	4	Vocab2	OID078	26
DomainCategory5	Domain53	Steward13	3	Vocab2	OID150	37
DomainCategory4	Domain42	Steward09	3	Vocab1	OID109	3
DomainCategory3	Domain36	Steward06	4	Vocab1	OID079	24
DomainCategory6	Domain67	Steward09	3	Vocab1	OID237	33
DomainCategory3	Domain31	Steward09	3	Vocab3	OID060	64
DomainCategory5	Domain54	Steward02	5	Vocab3	OID159	32
DomainCategory3	Domain31	Steward22	5	Vocab3	OID058	37
DomainCategory5	Domain51	Steward14	3	Vocab1	OID141	365
DomainCategory5	Domain51	Steward20	4	Vocab1	OID138	477
DomainCategory8	Domain81	Steward08	2	Vocab3	OID206	9
DomainCategory6	Domain62	Steward14	3	Vocab1	OID175	7
DomainCategory7	Domain71	Steward10	5	Vocab2	OID195	5
DomainCategory8	Domain82	Steward14	3	Vocab2	OID215	9
DomainCategory6	Domain61	Steward09	3	Vocab3	OID220	28
DomainCategory5	Domain52	Steward12	5	Vocab2	OID143	52
DomainCategory2	Domain21	Steward14	3	Vocab3	OID035	101
DomainCategory5	Domain55	Steward14	3	Vocab1	OID164	12
DomainCategory1	Domain11	Steward05	5	Vocab2	OID002	1122
DomainCategory5	Domain53	Steward19	4	Vocab3	OID156	101
DomainCategory1	Domain11	Steward10	5	Vocab1	OID009	801
DomainCategory6	Domain68	Steward14	3	Vocab2	OID191	62
DomainCategory3	Domain31	Steward22	5	Vocab1	OID059	20
DomainCategory2	Domain24	Steward14	3	Vocab3	OID045	23
DomainCategory5	Domain53	Steward19	4	Vocab2	OID155	27
DomainCategory4	Domain42	Steward14	3	Vocab3	OID106	8
DomainCategory2	Domain21	Steward06	4	Vocab2	OID032	278
DomainCategory7	Domain73	Steward05	5	Vocab1	OID201	14
DomainCategory3	Domain34	Steward20	4	Vocab3	OID069	2
DomainCategory4	Domain43	Steward08	2	Vocab2	OID114	3
DomainCategory1	Domain13	Steward14	3	Vocab1	OID021	13
DomainCategory4	Domain44	Steward08	2	Vocab3	OID119	63
DomainCategory5	Domain55	Steward18	3	Vocab2	OID170	11
DomainCategory3	Domain37	Steward10	5	Vocab2	OID087	37
DomainCategory6	Domain62	Steward08	2	Vocab2	OID172	10
DomainCategory6	Domain68	Steward14	3	Vocab3	OID189	185
DomainCategory1	Domain12	Steward05	5	Vocab1	OID012	10
DomainCategory1	Domain15	Steward18	3	Vocab3	OID031	12
DomainCategory4	Domain42	Steward09	3	Vocab3	OID111	5
DomainCategory5	Domain55	Steward04	4	Vocab1	OID166	10
DomainCategory2	Domain21	Steward14	3	Vocab2	OID034	304

DomainCategory1	Domain12	Steward05	5	Vocab2	OID013	28
DomainCategory4	Domain44	Steward08	2	Vocab2	OID120	25
DomainCategory6	Domain63	Steward14	3	Vocab3	OID179	24
DomainCategory6	Domain65	Steward14	3	Vocab1	OID186	7
DomainCategory2	Domain23	Steward14	3	Vocab2	OID042	98
DomainCategory3	Domain32	Steward03	2	Vocab1	OID094	2
DomainCategory8	Domain83	Steward10	5	Vocab1	OID218	1
DomainCategory1	Domain11	Steward05	5	Vocab1	OID001	707
DomainCategory3	Domain33	Steward10	5	Vocab2	OID061	7
DomainCategory5	Domain51	Steward20	4	Vocab3	OID139	1278
DomainCategory3	Domain34	Steward03	2	Vocab3	OID072	12
DomainCategory1	Domain13	Steward14	3	Vocab2	OID022	15
DomainCategory1	Domain13	Steward14	3	Vocab3	OID020	53
DomainCategory3	Domain38	Steward06	4	Vocab2	OID088	394
DomainCategory2	Domain23	Steward21	7	Vocab1	OID040	19
DomainCategory6	Domain63	Steward14	3	Vocab1	OID180	9
DomainCategory6	Domain67	Steward03	2	Vocab3	OID242	19
DomainCategory5	Domain55	Steward13	3	Vocab1	OID162	12
DomainCategory4	Domain41	Steward18	3	Vocab3	OID104	50
DomainCategory3	Domain38	Steward14	3	Vocab1	OID089	59
DomainCategory6	Domain61	Steward03	2	Vocab2	OID224	950
DomainCategory5	Domain55	Steward14	3	Vocab3	OID163	57
DomainCategory2	Domain22	Steward12	5	Vocab3	OID037	6
DomainCategory7	Domain71	Steward08	2	Vocab3	OID193	1
DomainCategory3	Domain39	Steward15	5	Vocab2	OID127	33
DomainCategory5	Domain53	Steward13	3	Vocab3	OID149	106
DomainCategory3	Domain37	Steward10	5	Vocab3	OID086	193
DomainCategory3	Domain39	Steward20	4	Vocab3	OID130	33
DomainCategory3	Domain37	Steward14	3	Vocab3	OID083	49
DomainCategory4	Domain43	Steward08	2	Vocab3	OID113	14
DomainCategory4	Domain44	Steward14	3	Vocab3	OID121	139
DomainCategory3	Domain31	Steward06	4	Vocab3	OID050	2
DomainCategory2	Domain24	Steward21	7	Vocab1	OID044	18
DomainCategory5	Domain51	Steward20	4	Vocab2	OID137	756
DomainCategory5	Domain51	Steward14	3	Vocab3	OID140	1269
DomainCategory5	Domain55	Steward18	3	Vocab3	OID169	53
DomainCategory6	Domain64	Steward14	3	Vocab1	OID229	8
DomainCategory7	Domain72	Steward14	3	Vocab2	OID198	13
DomainCategory3	Domain35	Steward09	3	Vocab3	OID075	25
DomainCategory5	Domain55	Steward18	3	Vocab1	OID171	10
DomainCategory6	Domain61	Steward09	3	Vocab2	OID222	22

DomainCategory4	Domain43	Steward06	4	Vocab2	OID116	8
DomainCategory7	Domain72	Steward14	3	Vocab3	OID196	52
DomainCategory1	Domain11	Steward10	5	Vocab3	OID008	3746
DomainCategory8	Domain81	Steward14	3	Vocab2	OID209	2

Appendix 4. Table of Intersection Size DataSet

Domain Category	Domain	Vocabulary	Purpose	OID File i	Value Set Size i	OID File j	Value Set Size j	Intersection
DomainCategory3	Domain35	Vocab2	3	OID074	9	OID076	10	9
DomainCategory4	Domain41	Vocab1	4	OID101	11	OID102	14	11
DomainCategory4	Domain41	Vocab1	5	OID099	9	OID102	14	7
DomainCategory3	Domain31	Vocab2	4	OID049	9	OID057	14	9
DomainCategory4	Domain41	Vocab2	5	OID098	18	OID100	18	18
DomainCategory2	Domain22	Vocab2	5	OID036	16	OID039	9	9
DomainCategory3	Domain31	Vocab1	3	OID051	20	OID054	31	20
DomainCategory3	Domain38	Vocab2	4	OID088	394	OID090	351	351
DomainCategory4	Domain44	Vocab2	2	OID120	25	OID123	23	7
DomainCategory1	Domain11	Vocab2	5	OID002	1122	OID003	1160	1117
DomainCategory3	Domain31	Vocab1	3	OID054	31	OID056	20	20
DomainCategory6	Domain65	Vocab3	2	OID183	30	OID185	21	16
DomainCategory3	Domain32	Vocab2	2	OID093	1	OID095	2	1
DomainCategory5	Domain55	Vocab1	3	OID164	12	OID166	10	10
DomainCategory2	Domain24	Vocab1	7	OID044	18	OID047	20	18
DomainCategory4	Domain43	Vocab3	2	OID113	14	OID115	8	5
DomainCategory6	Domain64	Vocab3	2	OID226	97	OID228	35	33
DomainCategory2	Domain21	Vocab2	4	OID032	278	OID034	304	278
DomainCategory5	Domain51	Vocab3	3	OID136	1028	OID139	1278	1007
DomainCategory4	Domain43	Vocab3	4	OID115	8	OID118	22	4
DomainCategory4	Domain44	Vocab3	2	OID119	63	OID125	17	5
DomainCategory5	Domain51	Vocab1	4	OID138	477	OID141	365	365
DomainCategory3	Domain31	Vocab1	3	OID054	31	OID059	20	19
DomainCategory6	Domain67	Vocab1	3	OID237	33	OID240	1	1
DomainCategory8	Domain83	Vocab2	2	OID217	2	OID219	1	1
DomainCategory3	Domain36	Vocab1	4	OID079	24	OID080	24	23
DomainCategory5	Domain55	Vocab1	4	OID166	10	OID171	10	10
DomainCategory1	Domain11	Vocab1	5	OID001	707	OID004	796	589
DomainCategory4	Domain44	Vocab1	3	OID122	29	OID124	22	22
DomainCategory5	Domain54	Vocab3	5	OID159	32	OID161	115	25
DomainCategory3	Domain33	Vocab2	5	OID061	7	OID065	4	0
DomainCategory1	Domain12	Vocab2	5	OID011	54	OID015	27	27

DomainCategory1	Domain11	Vocab2	5	OID003	1160	OID005	1307	1160
DomainCategory6	Domain67	Vocab3	3	OID239	56	OID242	19	0
DomainCategory1	Domain11	Vocab2	5	OID003	1160	OID010	1602	1147
DomainCategory1	Domain11	Vocab2	3	OID005	1307	OID007	1601	1238
DomainCategory4	Domain42	Vocab1	3	OID107	4	OID109	3	0
DomainCategory4	Domain43	Vocab3	2	OID113	14	OID118	22	9
DomainCategory3	Domain31	Vocab3	4	OID050	2	OID060	64	2
DomainCategory5	Domain51	Vocab1	3	OID135	477	OID138	477	477
DomainCategory1	Domain12	Vocab2	5	OID013	28	OID015	27	27
DomainCategory1	Domain12	Vocab1	5	OID012	10	OID014	9	9
DomainCategory1	Domain11	Vocab1	5	OID001	707	OID009	801	559
DomainCategory3	Domain37	Vocab3	3	OID083	49	OID086	193	39
DomainCategory6	Domain61	Vocab2	3	OID222	22	OID224	950	1
DomainCategory5	Domain53	Vocab1	3	OID151	40	OID154	24	24
DomainCategory3	Domain34	Vocab1	4	OID066	2	OID070	1	1
DomainCategory3	Domain31	Vocab2	4	OID049	9	OID055	12	9
DomainCategory5	Domain53	Vocab2	3	OID150	37	OID155	27	27
DomainCategory1	Domain11	Vocab2	5	OID007	1601	OID010	1602	1601
DomainCategory3	Domain36	Vocab2	4	OID078	26	OID081	22	22
DomainCategory5	Domain55	Vocab3	3	OID163	57	OID169	53	51
DomainCategory3	Domain39	Vocab2	5	OID127	33	OID128	36	32
DomainCategory5	Domain55	Vocab3	4	OID167	36	OID169	53	36
DomainCategory4	Domain42	Vocab3	3	OID106	8	OID112	56	8
DomainCategory4	Domain41	Vocab2	5	OID097	20	OID103	18	18
DomainCategory6	Domain68	Vocab2	2	OID188	96	OID191	62	57
DomainCategory5	Domain53	Vocab2	3	OID152	37	OID155	27	27
DomainCategory1	Domain11	Vocab1	3	OID004	796	OID009	801	761
DomainCategory3	Domain34	Vocab3	4	OID068	19	OID069	2	0
DomainCategory1	Domain13	Vocab1	5	OID018	12	OID021	13	12
DomainCategory1	Domain11	Vocab3	3	OID006	3850	OID008	3746	3746
DomainCategory8	Domain82	Vocab1	4	OID210	9	OID214	9	9
DomainCategory4	Domain42	Vocab3	3	OID111	5	OID112	56	5
DomainCategory3	Domain31	Vocab2	4	OID049	9	OID052	9	9
DomainCategory8	Domain82	Vocab2	4	OID211	8	OID215	9	8
DomainCategory3	Domain35	Vocab3	3	OID075	25	OID077	51	25
DomainCategory4	Domain44	Vocab2	2	OID120	25	OID126	22	7
DomainCategory5	Domain51	Vocab2	4	OID137	756	OID142	291	274
DomainCategory3	Domain31	Vocab2	3	OID052	9	OID057	14	9
DomainCategory3	Domain31	Vocab2	5	OID048	9	OID049	9	9
DomainCategory1	Domain15	Vocab1	5	OID027	1	OID029	1	1
DomainCategory1	Domain15	Vocab2	5	OID028	1	OID030	1	1

DomainCategory5	Domain51	Vocab3	3	OID136	1028	OID140	1269	752
DomainCategory1	Domain13	Vocab2	5	OID019	12	OID022	15	12
DomainCategory4	Domain44	Vocab3	3	OID121	139	OID125	17	16
DomainCategory3	Domain31	Vocab3	5	OID058	37	OID060	64	36
DomainCategory3	Domain31	Vocab2	3	OID052	9	OID055	12	9
DomainCategory1	Domain11	Vocab2	5	OID002	1122	OID007	1601	1115
DomainCategory5	Domain51	Vocab1	3	OID135	477	OID141	365	365
DomainCategory5	Domain53	Vocab1	3	OID148	40	OID151	40	40
DomainCategory6	Domain63	Vocab3	2	OID177	21	OID179	24	21
DomainCategory5	Domain53	Vocab3	3	OID149	106	OID153	96	96
DomainCategory3	Domain32	Vocab3	2	OID092	1	OID096	14	1
DomainCategory7	Domain72	Vocab2	3	OID198	13	OID200	4	3
DomainCategory2	Domain23	Vocab1	7	OID040	19	OID041	20	19
DomainCategory2	Domain22	Vocab3	5	OID037	6	OID038	3	3
DomainCategory8	Domain82	Vocab3	4	OID212	23	OID213	28	23
DomainCategory5	Domain55	Vocab1	3	OID164	12	OID171	10	10
DomainCategory4	Domain43	Vocab2	2	OID114	3	OID116	8	2
DomainCategory6	Domain66	Vocab3	3	OID235	13	OID236	28	11
DomainCategory5	Domain55	Vocab2	3	OID165	12	OID170	11	10
DomainCategory3	Domain37	Vocab2	3	OID085	14	OID087	37	14
DomainCategory8	Domain81	Vocab3	2	OID206	9	OID207	14	9
DomainCategory6	Domain62	Vocab2	2	OID172	10	OID176	8	8
DomainCategory3	Domain34	Vocab3	4	OID068	19	OID072	12	12
DomainCategory5	Domain53	Vocab3	3	OID153	96	OID156	101	93
DomainCategory7	Domain73	Vocab2	5	OID202	19	OID204	82	1
DomainCategory3	Domain31	Vocab2	5	OID048	9	OID052	9	9
DomainCategory6	Domain61	Vocab3	3	OID220	28	OID225	3093	5
DomainCategory4	Domain42	Vocab3	3	OID106	8	OID111	5	5
DomainCategory7	Domain73	Vocab1	5	OID201	14	OID203	53	2
DomainCategory6	Domain63	Vocab2	2	OID178	13	OID181	11	11
DomainCategory4	Domain41	Vocab2	5	OID097	20	OID098	18	18
DomainCategory5	Domain55	Vocab2	4	OID168	10	OID170	11	10
DomainCategory3	Domain31	Vocab1	3	OID051	20	OID056	20	20
DomainCategory1	Domain14	Vocab3	3	OID023	84	OID026	56	55
DomainCategory5	Domain53	Vocab3	3	OID149	106	OID156	101	97
DomainCategory5	Domain52	Vocab3	5	OID144	91	OID147	159	67
DomainCategory3	Domain33	Vocab3	5	OID062	41	OID063	6	4
DomainCategory6	Domain67	Vocab2	3	OID238	37	OID241	1	1
DomainCategory4	Domain44	Vocab2	3	OID123	23	OID126	22	21
DomainCategory3	Domain31	Vocab1	3	OID056	20	OID059	20	19
DomainCategory1	Domain11	Vocab2	5	OID002	1122	OID005	1307	1122

DomainCategory1	Domain11	Vocab2	3	OID005	1307	OID010	1602	1239
DomainCategory4	Domain42	Vocab2	4	OID105	12	OID108	3	3
DomainCategory3	Domain31	Vocab3	3	OID053	47	OID060	64	44
DomainCategory6	Domain66	Vocab2	3	OID232	4	OID234	1	1
DomainCategory6	Domain62	Vocab3	2	OID173	19	OID174	15	12
DomainCategory1	Domain12	Vocab2	5	OID011	54	OID013	28	27
DomainCategory4	Domain42	Vocab2	3	OID108	3	OID110	3	3
DomainCategory4	Domain41	Vocab2	5	OID097	20	OID100	18	18
DomainCategory5	Domain51	Vocab2	3	OID134	848	OID142	291	285
DomainCategory3	Domain31	Vocab3	4	OID050	2	OID058	37	0
DomainCategory5	Domain55	Vocab1	3	OID162	12	OID166	10	10
DomainCategory3	Domain31	Vocab1	3	OID051	20	OID059	20	19
DomainCategory1	Domain12	Vocab3	3	OID016	48	OID017	69	45
DomainCategory3	Domain34	Vocab3	4	OID069	2	OID072	12	0
DomainCategory5	Domain55	Vocab1	3	OID162	12	OID164	12	12
DomainCategory1	Domain11	Vocab2	5	OID003	1160	OID007	1601	1146
DomainCategory4	Domain41	Vocab2	4	OID100	18	OID103	18	18
DomainCategory4	Domain41	Vocab1	5	OID099	9	OID101	11	7
DomainCategory3	Domain31	Vocab2	5	OID048	9	OID057	14	9
DomainCategory6	Domain64	Vocab2	2	OID227	43	OID230	40	0
DomainCategory5	Domain55	Vocab2	3	OID165	12	OID168	10	10
DomainCategory7	Domain71	Vocab2	2	OID192	2	OID195	5	1
DomainCategory8	Domain81	Vocab2	2	OID205	3	OID209	2	2
DomainCategory5	Domain55	Vocab1	3	OID162	12	OID171	10	10
DomainCategory6	Domain66	Vocab1	3	OID231	3	OID233	1	1
DomainCategory5	Domain51	Vocab2	3	OID134	848	OID137	756	717
DomainCategory4	Domain42	Vocab2	4	OID105	12	OID110	3	3
DomainCategory5	Domain53	Vocab1	3	OID148	40	OID154	24	24
DomainCategory3	Domain34	Vocab2	4	OID067	7	OID071	4	4
DomainCategory6	Domain68	Vocab3	2	OID187	201	OID189	185	180
DomainCategory6	Domain61	Vocab1	3	OID221	4	OID223	744	0
DomainCategory3	Domain31	Vocab3	4	OID050	2	OID053	47	2
DomainCategory4	Domain44	Vocab3	2	OID119	63	OID121	139	51
DomainCategory5	Domain51	Vocab3	4	OID139	1278	OID140	1269	935
DomainCategory7	Domain72	Vocab1	3	OID197	9	OID199	5	5
DomainCategory6	Domain65	Vocab2	2	OID182	12	OID184	8	8
DomainCategory3	Domain31	Vocab2	3	OID055	12	OID057	14	9
DomainCategory5	Domain54	Vocab2	5	OID158	25	OID160	16	9
DomainCategory5	Domain55	Vocab3	3	OID163	57	OID167	36	36
DomainCategory5	Domain53	Vocab2	3	OID150	37	OID152	37	37
DomainCategory3	Domain31	Vocab3	3	OID053	47	OID058	37	37

DomainCategory5	Domain52	Vocab2	5	OID143	52	OID146	60	41
DomainCategory3	Domain31	Vocab2	5	OID048	9	OID055	12	9
DomainCategory1	Domain11	Vocab2	5	OID002	1122	OID010	1602	1116
DomainCategory4	Domain41	Vocab2	5	OID098	18	OID103	18	18

Appendix 5. Tables of ANOVA Results

Appendix 5.1. Analysis of Variance Between Log 10 Value Set Size and Domain Category

```
                    Analysis of Variance
    Source              SS       df      MS            F     Prob > F
------------------------------------------------------------------------------
Between groups      24.9020841      7   3.55744059      7.22     0.0000
 Within groups      113.895475    231   .493054005
------------------------------------------------------------------------------
    Total           138.797559    238   .583183023

Bartlett's test for equal variances:  chi2(7) =  34.4486  Prob>chi2 = 0.000
```

Appendix 5.2. Analysis of Variance Between Log 10 Value Set Size and Domain

```
                    Analysis of Variance
    Source              SS       df      MS            F     Prob > F
------------------------------------------------------------------------------
Between groups      105.884522     40   2.64711304     15.92     0.0000
 Within groups      32.9130377    198   .166227463
------------------------------------------------------------------------------
    Total           138.797559    238   .583183023

Bartlett's test for equal variances:  chi2(40) =  75.0137  Prob>chi2 = 0.001
```

Appendix 5.3. Analysis of Variance Between Log 10 Value Set Size and Vocabulary

```
                    Analysis of Variance
    Source              SS       df      MS            F     Prob > F
------------------------------------------------------------------------------
Between groups      7.48056758      2   3.74028379      6.72     0.0014
 Within groups      131.316992    236   .556427931
------------------------------------------------------------------------------
    Total           138.797559    238   .583183023

Bartlett's test for equal variances:  chi2(2) =   0.9919  Prob>chi2 = 0.609
```

Appendix 5.4. Analysis of Variance Between Log 10 Value Set Size and Steward

```
                    Analysis of Variance
    Source              SS       df       MS          F     Prob > F
------------------------------------------------------------------------------
Between groups      7.56296178     21   .360141037      0.60     0.9193
 Within groups      131.234598    217   .604767731
------------------------------------------------------------------------------
    Total           138.797559    238   .583183023

Bartlett's test for equal variances:  chi2(20) =  50.6812  Prob>chi2 = 0.000

note: Bartlett's test performed on cells with positive variance:
      1 single-observation cells not used
```

Appendix 5.5. Analysis of Variance Between Log 10 Value Set Size and Purpose

```
                    Analysis of Variance
    Source              SS       df       MS          F     Prob > F
------------------------------------------------------------------------------
Between groups      3.44864723      3   1.14954908      1.98     0.1178
 Within groups      135.329382    233   .580812799
------------------------------------------------------------------------------
    Total           138.778029    236   .588042498

Bartlett's test for equal variances:  chi2(3) =   4.9048  Prob>chi2 = 0.179
```

Appendix 5.6. Analysis of Variance Between Log 10 Intersection and Domain Category

```
                    Analysis of Variance
    Source              SS       df       MS          F     Prob > F
------------------------------------------------------------------------------
Between groups      42.5116282      7   6.07308974     13.33     0.0000
 Within groups      65.1639055    143   .455691647
------------------------------------------------------------------------------
    Total           107.675534    150   .717836892

Bartlett's test for equal variances:  chi2(7) =  35.3653  Prob>chi2 = 0.000
```

Appendix 5.7. Analysis of Variance Between Log 10 Intersection and Domain

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	98.6824204	40	2.46706051	30.18	0.0000
Within groups	8.99311332	110	.081755576		
Total	107.675534	150	.717836892		

Bartlett's test for equal variances: chi2(26) = 21.7648 Prob>chi2 = 0.701

note: Bartlett's test performed on cells with positive variance:
10 single-observation cells not used
4 multiple-observation cells not used

Appendix 5.8. Analysis of Variance Between Log 10 Intersection and Vocabulary

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	.400530078	2	.200265039	0.28	0.7590
Within groups	107.275004	148	.724831106		
Total	107.675534	150	.717836892		

Bartlett's test for equal variances: chi2(2) = 3.0082 Prob>chi2 = 0.222

Appendix 6. A Table of Means of Log 10 Value Set per Purpose and Log 10 Intersection Size

Purpose i	Purpose j	Mean of Log 10 Value Set Size i per Purpose i	Mean of Log 10 Value Set Size j per Purpose j	Mean Log 10 Intersection
2	2	0	0.72	0
2	3	1.44	1.34	1.16
2	4	0.81	0.90	0.5
2	5	0.58	0.68	0.32
3	2	1.32	1.74	0.75
3	3	1.41	1.31	1.29
3	4	1.84	1.76	1.74
3	5	1.84	1.87	1.74
4	2	0.68	0.69	0.56
4	3	1.42	1.50	1.33
4	4	1.28	0.30	0
4	5	0.60	1.46	0.60
5	2	1.23	0.69	0.60
5	3	1.33	1.33	1.27
5	4	1.20	1.21	1.16
5	5	2.22	2.37	2.00
7	3	1.27	1.30	1.27

Appendix 7. Table of Linear Regression Results of Mean of the Intersection by the Means of Value Set Sizes Per Purposes

```
      Source |       SS       df       MS              Number of obs =      17
-------------+------------------------------           F(  2,    14) =   41.46
       Model |  4.91439671     2  2.45719836           Prob > F      =  0.0000
    Residual |  .829650303    14  .059260736           R-squared     =  0.8556
-------------+------------------------------           Adj R-squared =  0.8349
       Total |  5.74404702    16  .359002939           Root MSE      =  .24344

------------------------------------------------------------------------------
mean_lg10in~n |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
mean_lg10vs~i |   .5173978    .158465     3.27   0.006     .1775241    .8572714
mean_lg10vs~j |   .6039582   .1608007     3.76   0.002      .259075    .9488414
        _cons |  -.4168781   .1621925    -2.57   0.022    -.7647465   -.0690097
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AUTHOR BIOGRAPHY

Dwi Margawati was born in Balikpapan, East Borneo, Indonesia. She spent most of her life in Malang and Yogyakarta, Java, Indonesia. She completed her Undergraduate degrees in Health Information Management as well as Public Health Science in Yogyakarta, Indonesia.

After graduating, she worked as a lecturer at Universitas Jenderal Achmad Yani in Yogyakarta, Indonesia teaching undergraduate students in Health Information Management and other subjects. She also worked as a mentor for high achieving students helping them to be able to write papers for and raise funds to attend the IFHIMA conference in Tokyo, Japan in 2016. In 2017 she was awarded with the USAID PRESTASI Scholarship. She pursued a Masters' in Health Sciences Informatics Research as well as Global Health Certificate at the Johns Hopkins University School of Medicine and graduated in 2019.

While at Hopkins, she participated in various voluntary activities. She also interned at JHPIEGO, an international, non-profit health organization dedicated to improving the health of women and families. During 2018, she also worked as a teaching assistant helping the course Instructor to check the class materials, grade students' assignments, and evaluate the course. Aside from activities close to campus she attended conferences, most notably the AMIA conference in San Francisco in the spring of 2019. Her other activities included crocheting, sewing, painting, drawing, playing keyboard and various other arts.

She has a passion for healthcare improvement in rural areas as well as mentoring university students and young professionals in Health Informatics and Information Management and Health-related field research. She plans to eventually create her on NGO focusing on Family/Maternal and Child health and to help rural areas in Indonesia improve their healthcare. To that end, she will be continuing her education with an MBA at Johns Hopkins University Carey Business School under a direct scholarship from Johns Hopkins, which will give her the tools and connections necessary to manage an organization and start her NGO.

Her experience in Public Health, Health Information Management, Informatics, and the Business and Organizational Management skills she will learn at Carey Business School, provide her with the tools and profound understanding to help vastly improve healthcare in the rural areas of Indonesia and Indonesia as a whole.